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ABSTRACT

This Teacher's Guide for first-grade mathematics is an outgrowth of an extended pilot project conducted nationwide between 1973 and 1976. The manner of presentation and the pedagogical ideas and tools are based on the works of Georges and Frederique Papy. They are recognized as having introduced colored arrow drawings ("papygrams") and models of our numeration system (the Papy "minicomputer") into the teaching of mathematics at the elementary and secondary level in Belgium. The CSMP curriculum follows the "spiral approach." The guide emphasizes that a topic may provide children with intuitive leaps which might help them acquire successive pieces of information. The Teacher's Guides for first grade are bound in two volumes. This part is the second volume and includes eighty lessons for the second semester. Each lesson is summarized, described, and illustrated. Materials for the student and the teacher are given. Suggestions for organizing the lessons on a month-to-month basis reflect the experiences of the CSMP staff in developing the curriculum. In the appendix, the teacher is provided with information to enable him/her to teach the String Game, a game which is developed and reinforced throughout the CSMP curriculum. Worksheets for the students accompany the guide. (Author/SA)

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CSMP Mathematics for the First Grade
Part II

Teacher's Guide

ED175636

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Comprehensive School Mathematics Program

CSMP Mathematics for the First Grade
Part II

Teacher's Guide

CEMREL, Inc.

PREFACE

CSMP Mathematics for the First Grade owes its existence to the coming together under the leadership of Burt Kaufman (CSMP Director) of a special group of people who have been concerned not only about the kind of mathematics that is being taught to children but also about the manner in which it is taught. This is even more important in the crucial early years of a child's life than in later years.

The CSMP first grade curriculum is in large part the outgrowth of a great deal of active involvement with children in ordinary classroom settings, and its present form was strongly influenced by information gathered from classes participating in an Extended Pilot Test conducted nationwide during 1973-77. But its manner of presentation and its main pedagogical ideas and tools, which stand out from all other curricula, are based on the pioneering works of Georges and Frédérique Papy acknowledged here with deep gratitude.

Use of colored arrow diagrams[*] -

Georges Papy, *Die Erste Elemente der Moderne Mathematik*:
Shriftenreihe zur Mathematik, Hefte 10-11
(Frankfurt and Hamburg: Otto Salle Verlag,
1962-63)
Mathématique Moderne, Vols. 1,2,3,5,6
(Brussels and Paris: Didier, 1964-1967)
Modern Mathematics 1, 2 (London: Collier-Macmillan Ltd., 1968)

Frédérique and Georges Papy, *L'Enfant et les Graphes*
(Brussels, Montreal and Paris: Didier, 1968)
Graphs and the Child (Montreal: Algonquin,
1970)

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[*] In 1959, Georges Papy introduced colored arrow diagrams into the teaching of mathematics at the elementary and secondary school level, and for this reason, they are sometimes referred to as "papygrams" in his honor.

Les Enfants de 4 Ans et Langage des Graphes
(Paris: Classiques Hachette, 1973)

Origin of the Papy Minicomputer-

Georges Papy, Minicomputer (Brussels: IVAC, 1968) in collaboration with Frédérique Papy

Use of graphs and the Papy Minicomputer with young children-

Frédérique Papy, Les Enfants et la Mathématique[*], Vols. 1, 2, 3, 4 (Brussels, Montreal and Paris: Didier, 1970-1976)

Mathematics and the Child 1, (Montreal: Algonquin, 1971)

By making this wealth of experience available to CSMP, Frédérique and Georges Papy have made an invaluable contribution to the production of this program. It must also be acknowledged that the fundamental idea of presenting mathematics to children via "pedagogical situations" is due to the mathematician and psychologist Caleb Gattegno.

Various prototype versions of the program dating back to 1973 were due to the efforts of former CSMP staff members Martin Caplan, Lowell Carmony, Edward Esty, Edward Martin, Sol Pelavin, and Joan Wakefield.

The large amount of information gleaned, thanks to the interest and concern of many teachers, in the Extended Pilot Tests since 1973 led to the revision of the program that culminated in this final version. During the 1976-77 school year, this final version has been tried out by CSMP staff members Kevin Saunders and Janis Schweitzer in Jackson Park Elementary School, University City, Missouri. In this effort they received valued collaboration and support of first grade teacher Helen Longfield and the motivating responses of her students.

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[*] A series of books reporting on an experiment in teaching mathematics in grades 1 to 6 in Brussels, using the languages of strings, arrows and the Papy Minicomputer. The reports of the first four years have been published by Didier; the reports of the last two years exist only in manuscript.

NOTE ON AUTHORSHIP

This printed copy of the final experimental version of the CSMP First Grade Program is the result of the work of the following people:

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NOTE TO THE TEACHER

This is the second of two volumes which together comprise the Teacher's Guide for the CSMP First Grade curriculum. In a sense, the second volume is simply a continuation of the Day-by-Day Guide section of the first volume. For that reason, most of the introductory material presented in Sections One and Two of the first volume --- such as PROGRAM DESCRIPTION, SUGGESTIONS FOR ORGANIZING THE PROGRAM, QUESTIONS AND ANSWERS ABOUT CSMP, and so on --- is not reprinted here. Rather, you are encouraged to seek out this information (if you have not yet done so) in CSMP Mathematics for the First Grade, Part I (pp. 3-44).

It should be noted, however, that in this volume the numbered sequence of lessons begins with S1.1 (continuing to S80)*; that a separate schedule for Part II is included; and that a special appendix dealing with the A-Blocks String Game is provided.

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* "S" is used in this volume as an abbreviation for "Second Semester", whereas "F" is used in Part I for "First Semester".

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S0 Things To Do Before Beginning This Volume

1. Prepare a list of lessons from CSMP Mathematics for the First Grade Part I, Teacher's Guide which you were not able to conduct earlier; you could not complete earlier; or you would like to repeat. This list should prove useful during the year, especially on adjustment days.

2. Set aside at least a brief period during which you should meet with other CSMP First Grade teachers in your school (if there are some), to discuss the progress of your classes and to share solutions to any problems which may have arisen.

EARLY WARNING!

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more than once during the nine-day period.)

S1.2 Length #1: masking tape

S4.2 A Game with A-Blocks #1: (Materials for playing this game are provided in the A-Block String Game kit, but you should see APPENDIX: The String Game, p.459, for a complete description of equipment and preparation required for the game.)

S9.2 Taxi-Geometry: (For this lesson you may use either a grid board (if one is available) or one of the newsprint grid posters (Robot Walk Grid) that are included in the CSMP classroom set of materials.

S 1

S1.1 Addition Problem #1

CAPSULE LESSON SUMMARY

Take a menu order for a pretend visit to a hamburger stand and, using the Minicomputer, determine the cost of the order.

MATERIALS

Teacher: Minicomputer set*
Student: None

DESCRIPTION OF LESSON

Choose one of your students to be the "star" of this story. Tell the following story or a similar one which might be more appropriate for your class.

T: Tonight, Leo is going to go to McDonald's (or Burger Chef or some similar place) for supper.

Allow the students to discuss this situation and ask the "star" of the story what he or she would buy at McDonald's.

T: Leo is going to buy a cheeseburger, an order of french fries, and a chocolate milkshake. The hamburger costs 29¢, the french fries cost 19¢, and the milkshake costs 23¢.

On the board, record the price of each item as you say it.

T: How can we find how much money Leo is going to spend on his supper tonight?

Allow the students to make suggestions. Follow or suggest yourself the method of using the Minicomputer to add the cost of the three items. Write the calculation on the board in both vertical and horizontal format, indicating that the calculation may be written either way.

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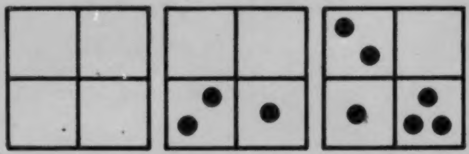
* A teacher's Minicomputer set consists of four demonstration Minicomputer boards and a sufficient number of magnetic demonstration Minicomputer checkers.

$$\begin{array}{r}29\\19\\+\ 23\\\hline\end{array} \qquad\qquad 29 + 19 + 23 =$$

You may wish to ask students to predict what the sum will be, recording some of their guesses on the board.

With student assistance, put the three numbers on the Minicomputer and then make some plays.



Continue letting volunteers make plays until the standard configuration for 71 is obtained. Complete the number stories on the board.

T: What coins could Leo take with him to pay for his supper exactly?

Allow the students to discuss this problem for just a few minutes. Accept any combination of coins whose value is exactly 71¢. Emphasize the notion that there are many interesting combinations of coins which equal 71¢.

S1.2 Length #1

CAPSULE LESSON SUMMARY

Measure (in footsteps) the length of an aisle in the classroom by repeatedly putting one foot in front of the other, heel-to-toe. Conduct a similar activity with handprints, measuring the length of a bulletin board (or chalkboard).

MATERIALS

Teacher: Masking tape
Student: None

DESCRIPTION OF LESSON

Choose an aisle in your classroom which goes through the middle of the class in a straight line. With pieces of masking tape, mark two spots on the floor so that one spot is even with the front of the first desk, and the other is even with the back of the last desk in that aisle.

T: I want to measure the length of this aisle (indicate the "marked" aisle), but I forgot to bring something to measure with. Is there some way I can find how long the aisle is?

S: You could use your feet; put one foot down and the other right in front of it, and count your steps.

Place your heel on the tape at the front of the class and measure the length of the aisle by stepping it off, heel-to-toe; the class should count the number of steps with you. Here is one possible result.

T: 1, 2 . . . 20; the aisle is a little more than 20 footsteps long.

Let's do this again to be sure we measured correctly; but this time, Jane (choose someone in the class) will measure.

Instruct the student to walk the aisle, heel-to-toe, as you did. This requires some balance and you may wish to hold the student's hand or shoulders to prevent a fall. Once again, the class should count along as the distance is stepped off.

T: 1, 2 . . . 26 steps; Jane took 26 footsteps. But I took only 20 footsteps. Did one of us make a mistake?

S: No; her feet are smaller.

S: She needs more steps than you do.

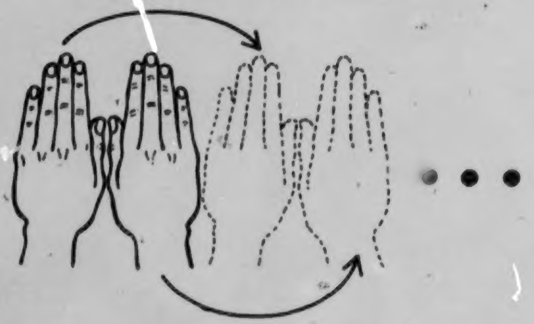
T: Very good. She has smaller feet so she needs more footsteps to walk down the aisle.

Choose a bulletin board (or chalkboard) which is accessible along its entire length.

T: How could I measure the length of the chalkboard?

S: Use your hands.

Start at one end of the board and measure to the other end by alternating hands, palms-down, as shown below. The class should count along with you.



Announce the result, for example, a little more than 32 handprints.

T: Now, all of you measure the width of your desks witn handprints.

Accept several results from various students and then continue.

T: Mark measured his desk to be seven hands wide, and Joe measured his to be nine hands wide. Does that mean Joe's desk is wider than Mark's?

S: No; Mark's hands are bigger so he can't fit as many on his desk.

T: Very good. When we measure with something small and then with something larger, we need more of the smaller unit.

S2.1 "Who Are You?" Number Game

CAPSULE LESSON SUMMARY:

Pretend that everyone in class is a secret number. Play a game in which you reveal one number, offer a clue which compares it to another number, and then ask the students to guess their number identities.

MATERIALS

Teacher: None
Student: None

DESCRIPTION OF LESSON

This is a short and quick warm-up activity that could be repeated whenever your class has a few spare minutes. Be sensitive to the difficulty of your questions, in terms of both the operations and the numbers involved, and adjust the level according to each student's ability, alternating easier questions with more difficult ones. Continue the activity for as long as student interest remains. (The questions suggested below are only examples; feel free to create your own.)

T: I am the number 5. Betty (substitute the name of someone in your class) is three more than I am. Who are you, Betty?

If Betty cannot answer, call on someone to answer for her.

S: 8.

T: Betty is the number 8. Barry is five more than Betty. Who are you Barry?

S: 13.

T: Barry is the number 13. Patty is three less than Barry. Who are you, Patty?

S: 10.

T: Patty is the number 10. John is seven less than Patty. Who are you, John?

S: 3.

T: John is the number 3, Cheryl is twice (two times) as big. Who are you Cheryl?

S: 6.

At any point during a sequence like this, feel free to begin again with a new number and a new student. Later in the year, you should also include questions similar to the following one.

T: I am the number 10. Tina is one-half of me. Who are you, Tina?

S: 5.

S2.2 A 2 x Spiral

CAPSULE LESSON SUMMARY

Label the dots in a 2 x spiral, using the Minicomputer to check some of the calculations.

MATERIALS

Teacher:	Minicomputer set; colored chalk
Student:	Paper; colored pencils; Worksheet S2.2* and **; Minicomputer set

DESCRIPTION OF LESSON

Very deliberately, draw a large red spiral of three or four arrows on the board and ask the students to copy it on their papers. Assist individual students who find it difficult to draw the spiral. In red, write "2 x" on the board near the spiral and direct the students to write "2 x" on their papers.

T: What are these red arrows for?

S: 2 x.

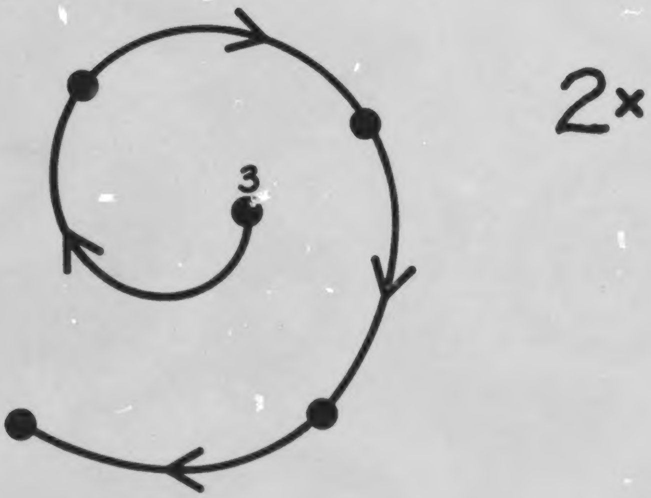
T: Do you know which numbers are in our arrow picture?

Students may begin to suggest several numbers; ask if they are certain that these numbers are in the spiral. Point out that you cannot be sure, as yet, about which numbers are in the picture.

T: The number which begins this spiral is 3.

Label the first dot "3" and ask the students to label the first dot on their papers. Check many of the students' papers to be sure the correct dot is labeled.

S 2



Trace the arrow which begins at 3.

T: 2 x 3. Which number is here (point to the second dot)?

S: 6.

T: 3 + 3 = 6, so 2 x 3 = 6.

Ask the students to label this dot "6" on their papers and on the board. Display three Minicomputer boards and ask a student to put 6 on the Minicomputer. Then, trace the arrow which begins at 6.

T: 2 x 6. What number is this?

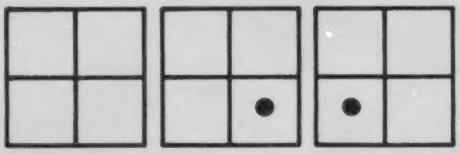
S: 12.

T: Let's calculate "2 x 6" on the Minicomputer. What number is on the Minicomputer now?

S: 6.

T: What should we do if we want to put 2 x 6 on the Minicomputer?

Someone should suggest putting 6 more on the Minicomputer. Ask one student to do so and ask another to make a play. Be prepared to suggest the "4 = 2 + 2" backward play, if necessary. Continue until the standard configuration for 12 is obtained.



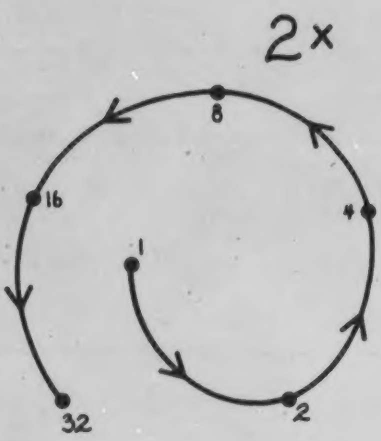
Repeat this procedure for "2 x 12", allowing students to predict the result before calculating it on the Minicomputer. Continue labeling the dots in your spiral, drawing more arrows as necessary, until you feel it is time to stop.

Individual students who wish to continue their spirals may be encouraged to do so later. Suggest that they use the Minicomputer to calculate the numbers.

Worksheets S2.2 * and ** are available. Allow students to use individual Minicomputers for the calculations involving larger numbers. (Do not expect all of your students to complete the one-star worksheet.)

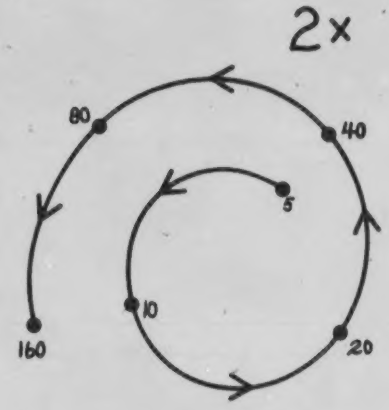
Name______________________ **S 2.2 ***

Label the dots.



Name______________________ **S 2.2 ****

Label the dots.



S3.1 Subtraction Problem #1

CAPSULE LESSON SUMMARY

Present several subtraction calculations in a story situation. Do the calculations on the Minicomputer.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

T: Last night, I walked to the store to buy some soda pop. I like to keep enough soda in my house for friends when they visit, so I bought 19 bottles. On the way home the bag broke, some of the soda bottles fell out, and eight bottles broke.

What problem can we write to find out how many bottles were left unbroken?

S: "19 - 8 = ?"

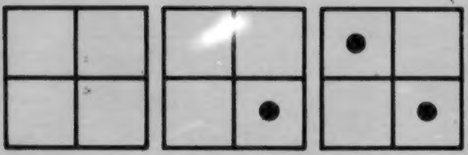
Write this calculation on the chalkboard.

$$\begin{array}{r} 19 \\ -\ 8 \\ \hline \end{array}$$

T: Let's see if we can use the Minicomputer to solve the problem. Who can put 19 on the Minicomputer?

Call on a student to do this. Encourage the student to use the standard configuration for 19 by asking for plays if necessary.

S 3



T: Now, who can come to the Minicomputer and take away 8?

Ask a student to do so. When the student has removed the checker from the 8-square, continue.

T: Good. We took away 8; what number is on the Minicomputer now?

S: 11.

Complete the calculation on the board.

$$\begin{array}{r} 19 \\ -\ 8 \\ \hline 11 \end{array}$$

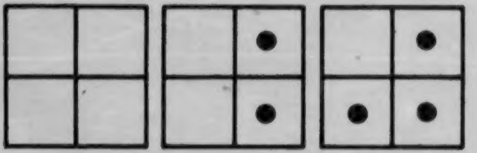
T: When I returned home from the store, I decided to read a book. The book was 57 pages long, but I read only 44 pages before falling asleep! What problem can we write to find the number of pages I must read to finish the book?

S: "57 - 44 = ?"

Write this new calculation on the board.

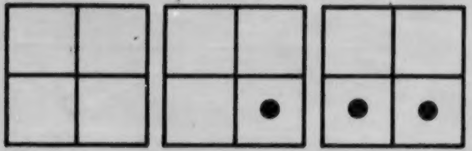
$$\begin{array}{r} 57 \\ -\ 44 \\ \hline \end{array}$$

T: Let's use the Minicomputer again. Who can put 57 on the Minicomputer?



T: Now, who can take away 44?

When a student has removed a checker from the 40-square and from the 4-square, continue.



T: How many pages do I have left to read?

S: 13.

Complete the calculation on the board.

$$\begin{array}{r} 57 \\ -\,44 \\ \hline 13 \end{array}$$

S3.2 A - 2 Arrow Road

CAPSULE LESSON SUMMARY

In a - 2 arrow picture use +2 return arrows to help label the dots.

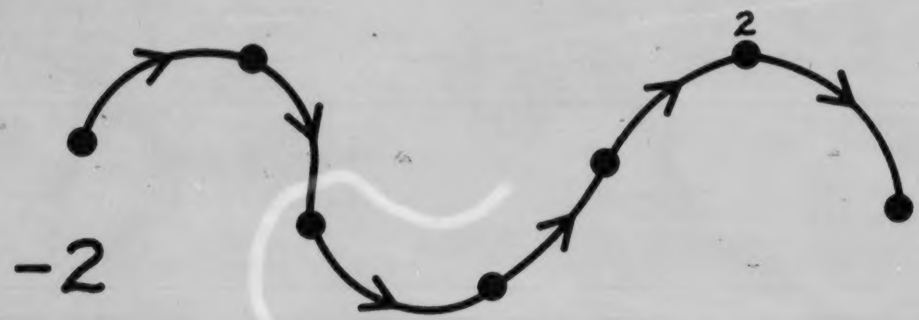
MATERIALS

Teacher: Colored chalk

Student: Worksheets S3.2* and **

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



T: The arrows are for - 2. Who can label this dot (point to the dot at the extreme right)?

Call on a student to label the dot. When the dot has been labeled " 0 ", continue as follows.

T: 2 (point to the dot labeled " 2 ") minus 2 (trace the arrow) is 0. Is that correct?

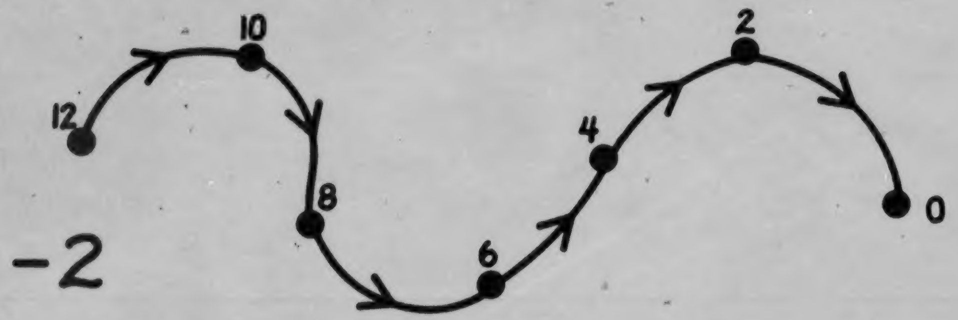
S: Yes.

Demonstrate this by starting at 2 on the number line and hopping two spaces to the left. A similar procedure could be used to show that a number other than 0 is incorrect.

T (pointing to the dot preceding 2): Which number is here?

S: 4.

To check the answer, repeat the procedure above. Continue in this manner until all of the dots have been labeled.



In blue, write "+2" next to your picture.

T: Who can draw a blue arrow for +2?

Call on students to draw +2 arrows. Each time an arrow is drawn, ask the students to explain why a +2 arrow can be drawn there. For example, a student might offer an explanation like this one.

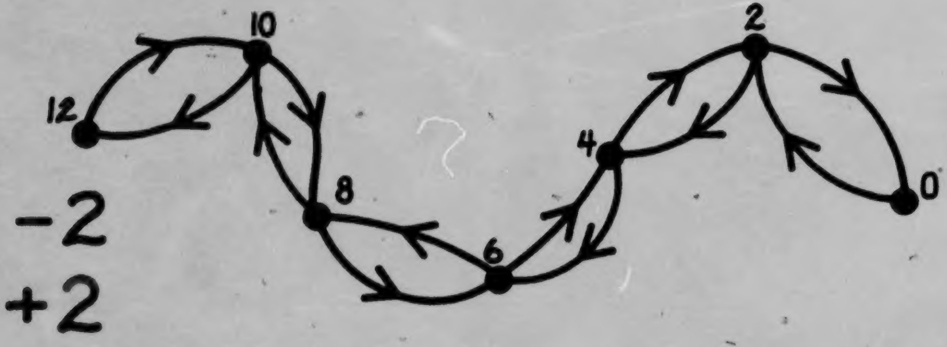
S: Because 0 plus 2 equals 2.

While not very likely, a student might also explain in this way (such thinking should be complimented):

S: I can draw a blue +2 arrow here because there is a red -2 arrow going the other way.

S 3

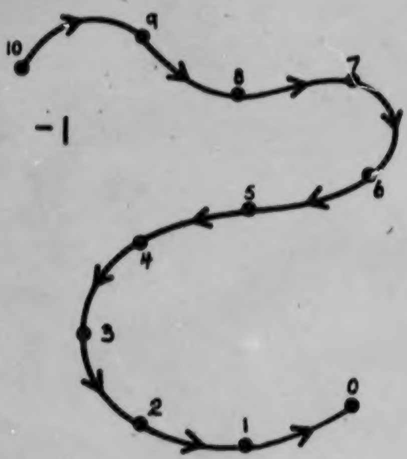
The completed picture will look like this.



Worksheets S3.2* and ** are available for individual work. If some students finish both worksheets early, ask them to add +1 arrows to the picture on S3.2*, and to add +2 and +3 arrows to both front and back pictures of S3.2**.

Name ____________________ S 3.2 *

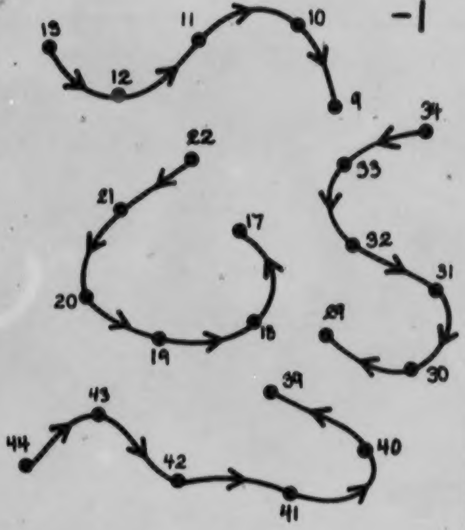
Label the dots.



-1

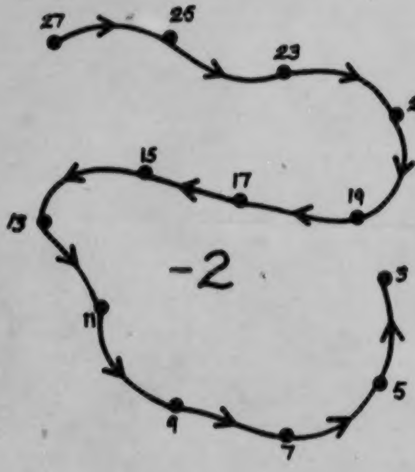
Label the dots.

-1



Name ____________________ S 3.2 **

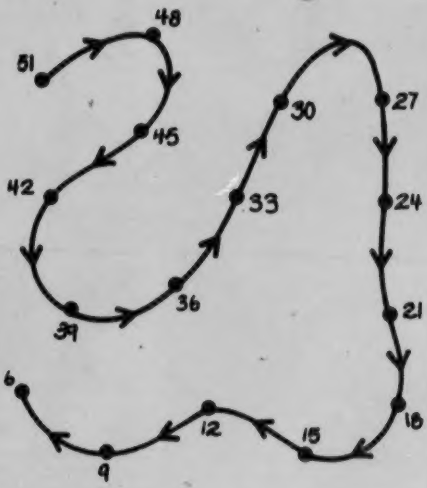
Label the dots.



-2

Label the dots.

-3



S 4

S4.1 Fair Distribution #1

CAPSULE LESSON SUMMARY

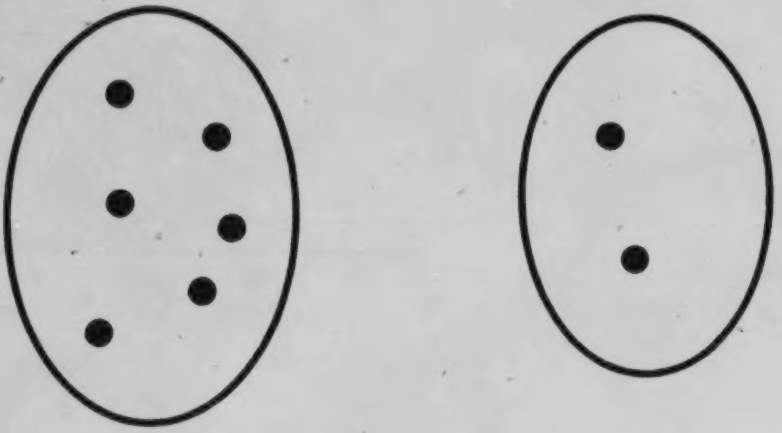
Inside a string draw dots for some cookies, and inside another string, draw dots for two children. Use arrows to show how to divide the cookies fairly between the children.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

Draw this picture on the board.



T: In the red string, I've drawn dots for some cookies. How many are there?

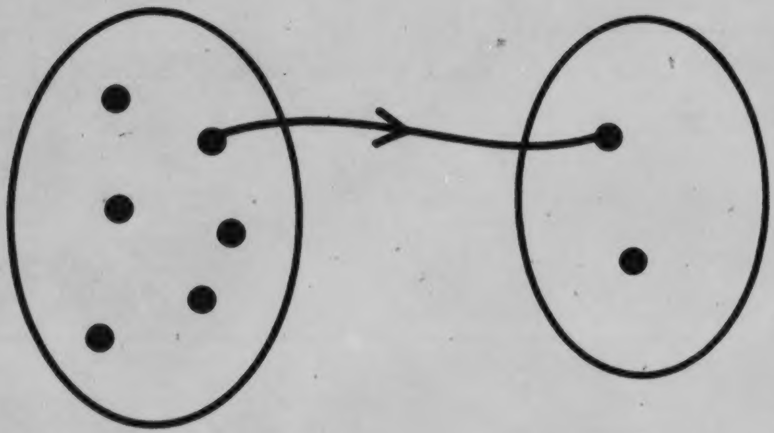
S: Six.

T: In the blue string are some children; how many children?

S: Two.

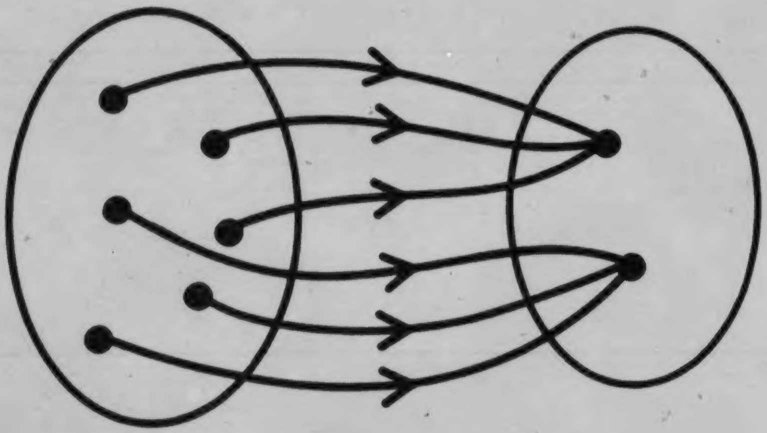
T: Who can draw an arrow to show giving one of the cookies to one of the children?

Choose a volunteer to draw one of the arrows. An example is shown below.



T: We want to share the cookies fairly; each child should receive the same number of cookies.

Call on students to distribute the remaining cookies.



Point to one of the dots in the blue string and ask a volunteer to count the cookies that this child receives. Repeat this for the other dot in the blue string.

T: Did both children receive the same number of cookies?

If they did not, ask how the picture should be changed. Correct the arrows and recount them. When the distribution is a fair one, continue.

T: We shared six cookies between two children. Each child received how many cookies?

S: Three.

T: One-half of 6 is ... ?

S: 3.

Write this number story on the board.

$$\frac{1}{2} \times 6 = 3$$

Repeat the activity with dots for ten candies in the red string, and dots for two children in the blue string. You should conclude with the following number story.

$$\frac{1}{2} \times 10 = 5$$

S4.2 A Game with A-Blocks #1

CAPSULE LESSON SUMMARY

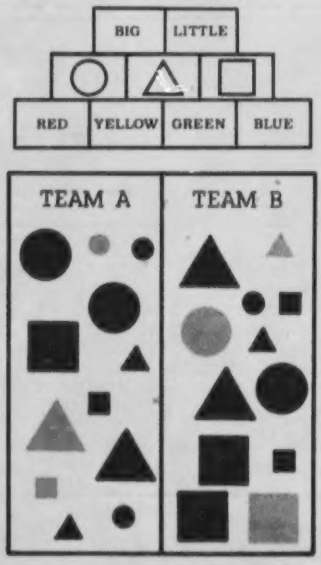
Play a game with A-Blocks placing the pieces in a one-string picture. The first team to correctly place all of its pieces in the string picture wins. When the string label is hidden, a team must also identify the string to win.

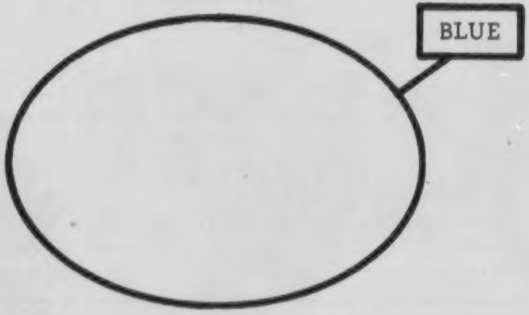
MATERIALS

Teacher: A-Block String Game kit* ; colored chalk
Student: None

DESCRIPTION OF LESSON

Prepare the game board and game pieces before the lesson begins, and divide the class into two teams. Then, draw this string on the board.





T: This string is for all of the blue A-blocks. Let's see which team can place its A-blocks in the correct places.

One by one, students from each team alternate placing their A-blocks in the picture.

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[*] See APPENDIX: The String Game for a description of equipment and preparation for the game.

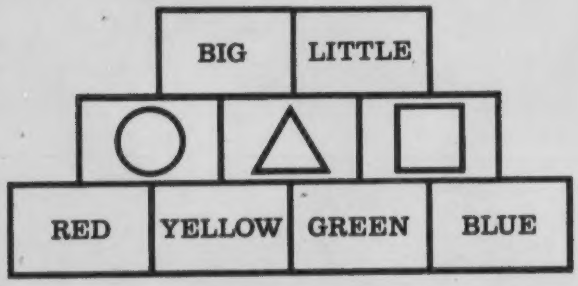
S 4

Team A members use the A-blocks on the "TEAM A" side of the team board, while Team B members use those on the "TEAM B" side. This activity may be too easy for your students; if so, after several pieces have been correctly placed in each area (blue pieces: inside the string; other pieces: outside the string), interrupt the game.

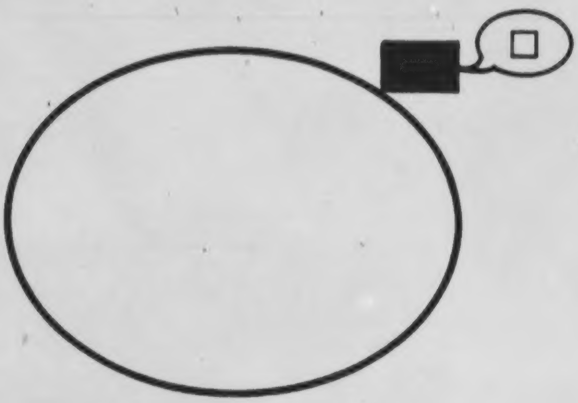
T: This is too easy for you; let's start over and play a game which is a little more challenging.

Replace the pieces on the team board (making sure they are still evenly distributed).

T: This time, I won't tell you what the string is for. It could be labeled with any of these labels (point to the list of possible string labels). Let's read them together.



Draw a string and place the string game card □ next to the string, face down.



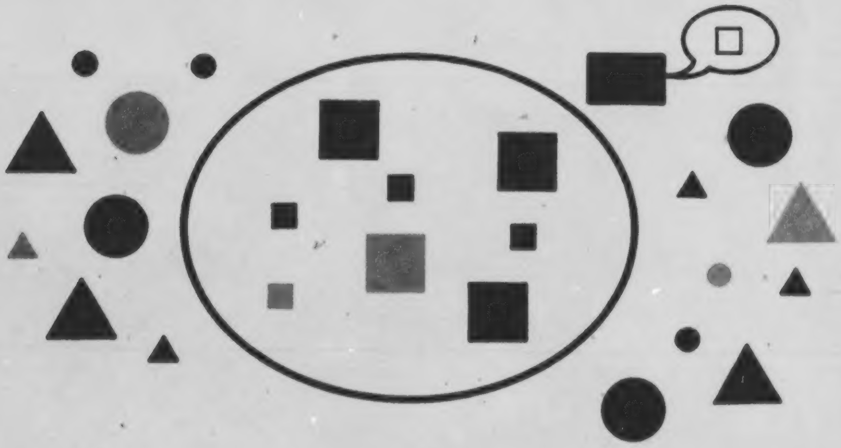
T: The string label is hidden; only I know what is written on this card. You must guess where each of your pieces go.

When one of the teams has placed all of its pieces correctly, the last player has a chance to tell what the string is for and win.

No one should talk during the game; students who talk will cause their team to lose a turn. Before we start, I will give you some clues.

Place a square (in the string) from among one team's pieces, and a circle or triangle (outside of the string) from the other team's pieces, and proceed to play the game.

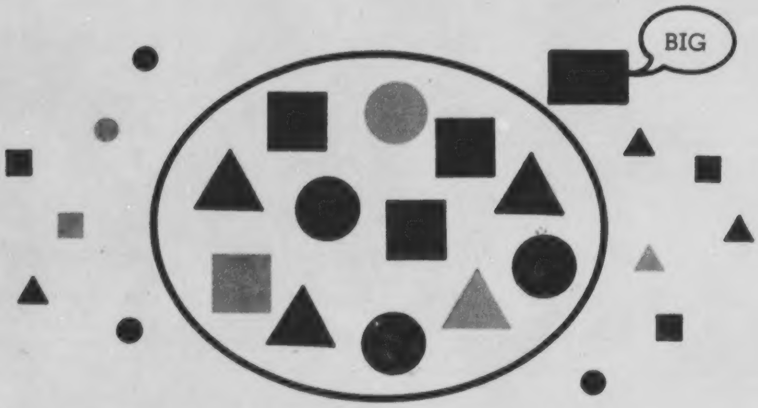
If a piece is correctly placed, say "yes" and allow the piece to remain in the picture; if the piece is placed incorrectly, say "no", and return it to the team board. To assist you in the judging of this game, the correct placement of all pieces is shown below.



If your class enjoyed this game and some time remains, play a second game using BIG for the hidden label. Place one piece from each team's pieces as starting clues.

S 4

The correct placement for all of the pieces is shown below.



S5.1 Subtraction Story

CAPSULE LESSON SUMMARY

Present a subtraction calculation in a story situation. Reinforce the logical thinking involved in the situation by drawing a string picture.

MATERIALS

Teacher: Colored chalk
Student: None

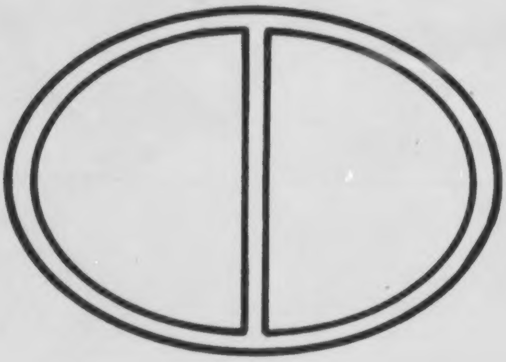
DESCRIPTION OF LESSON

Tell the following story or one similar to it.

T: This morning, 13 students came to school on either a skateboard or a bicycle. Exactly four of these students came to school on skateboards. How many students came to school on bicycles?

Let the students whisper their answers to you. It may be necessary to repeat the story.

Draw this string picture on the board.



T: The purple string is for all of the students who came to school on either skateboards or bicycles. How many students was that?

S: 13.

Write "13", in purple, near the string picture.

T: This red string is for all the students who came to school on skateboards. How many students was that?

S: Four.

In red, write "4" near the red string.

T: What is the blue string for?

S: The students who came to school on their bicycles.

T: How many students rode their bicycles?

Suppose, for example, that a student suggests seven.

T: Let's check and see if seven students came to school on bicycles.
4 + 7 = . . . ?

Hold up seven fingers for the students who rode their bicycles. Say "4 . . ." and then point to each finger in turn as you continue counting, "5, 6, 7, 8, 9, 10, 11."

T: 4 + 7 = 11. But we had said that 13 children came to school on skateboards or bicycles. We will have to try again.

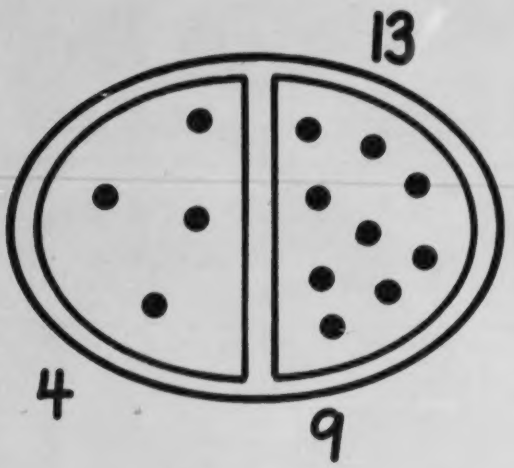
Accept another suggestion and check this possibility. Another way to check is to use the classroom number line or the 0-109 Numeral Chart. Continue until your class concludes that nine children came to school on bicycles. In blue, write "9" near the blue string.

T: Who could draw dots in our string picture for the 13 children?

- Ask a volunteer to draw the dots. Count all of the dots to confirm that $4 + 9 = 13$.

T: What number stories could we write about this string picture?

- Accept any appropriate number stories. If necessary, suggest "$13 - 4 = 9$" and "$13 - 9 = 4$" yourself.



$4 + 9 = 13$
$13 - 4 = 9$
$13 - 9 = 4$
$9 + 4 = 13$

S5.2 Locating Numbers on the Number Line

CAPSULE LESSON SUMMARY

Given the location of some numbers on the number line, ask students which numbers are at other points on the number line.

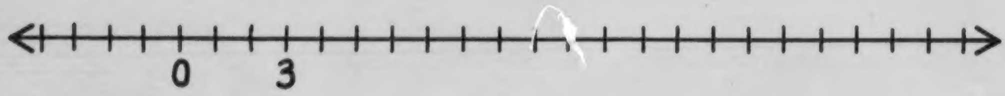
MATERIALS

Teacher: None
Student: Worksheets S5.2* and **

DESCRIPTION OF LESSON

Draw a number line on the board. The graduations should be equally spaced, at least six centimeters apart. You may wish to draw your number line somewhat shorter than the one shown here; the following description, however, is based on this illustration.

T: I located 0 and 3 on this number line.



T: Who knows where 1 is located?

When a student points to the correct mark label it "1" and then point to where 5 should be located.

T: What number goes here?

S: 5.

Label this point "5". Continue this activity until a variety of numbers have been located, and their positions labeled. Alternately, ask a student to identify the point you indicate and to locate the point for a number you give.

When the marks for 12 or 13 have been labeled, point to the last mark on the right (in this case, for 22).*

T: What number goes here?

Ask the students to whisper their answers to you; then send a student to the board to label this point. Indicate the next mark on the left (for 21).

T: Who can label this point?

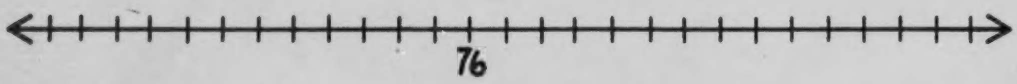
Ask a volunteer to do so.

T: How do you know that 21 is here?

Students might suggest counting backward; encourage this idea. Send several students to the board to label points of their choice, continuing until all of the marks to the right of "0" have been labeled.

One of your students may ask you to erase the marks to the left of "0", claiming that there are no numbers less than 0. You should simply say, "There are many numbers which are less than 0, but perhaps you don't know any of them yet." (If some students are aware of negative numbers, you may wish to let them label the marks to the left of "0".

Erase all of the labels, but not the number line itself, nor the graduation marks. Select a point near the center of the number line, and label it "76".



Point to the mark to the right of "76".

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* If you have chosen to draw a shorter number line on the board, adjust the dialogue here to fit your particular number line.

T: What number goes here?

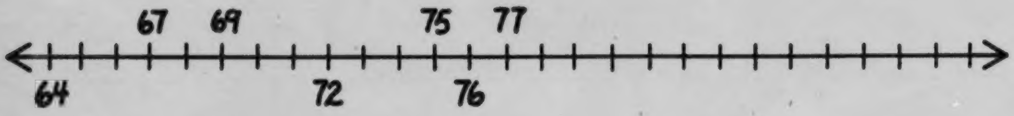
S: 77.

Label this point " 77 ", and then indicate the point just to the left of " 76 ".

T: What number goes here?

S: 75.

Label this point " 75 ". Point to a mark several spaces to the left of " 75 ", and ask a volunteer how this point should be labeled. Continue this process until the last point on your portion of the number line has been identified and labeled.



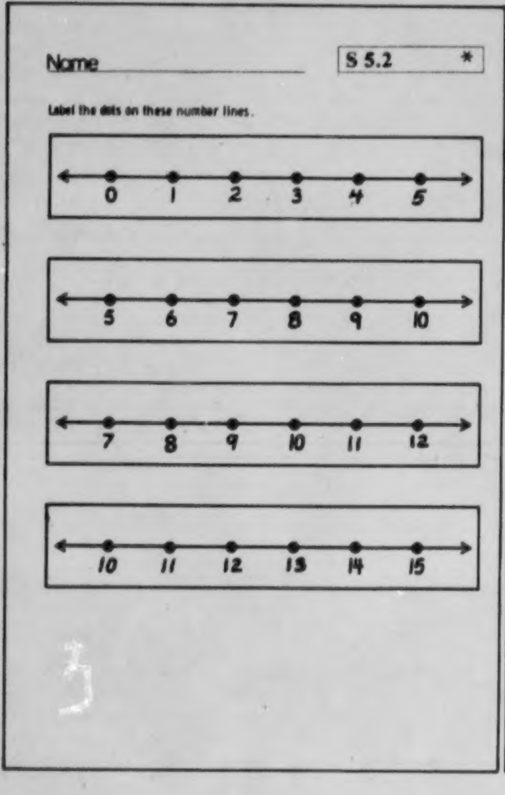
T: This is the last number we can put on our number line, but this arrow means that the line keeps going on forever, with more numbers on it. What (whole) number comes just before 64 on the number line? (63) What are some other numbers we would meet, if we traveled to the left along this number line?

Accept any numbers which are less than 64. Then, point to the last mark on the right.

T: What number goes here?

This is a difficult question because the students may find it difficult to count the marks accurately from their seats. Allow students to express their opinions, before sending a student to the board, to count forward from " 77 ".

Worksheets S5.2* and ** are available for the remainder of the period.



Name

S 5.2 *

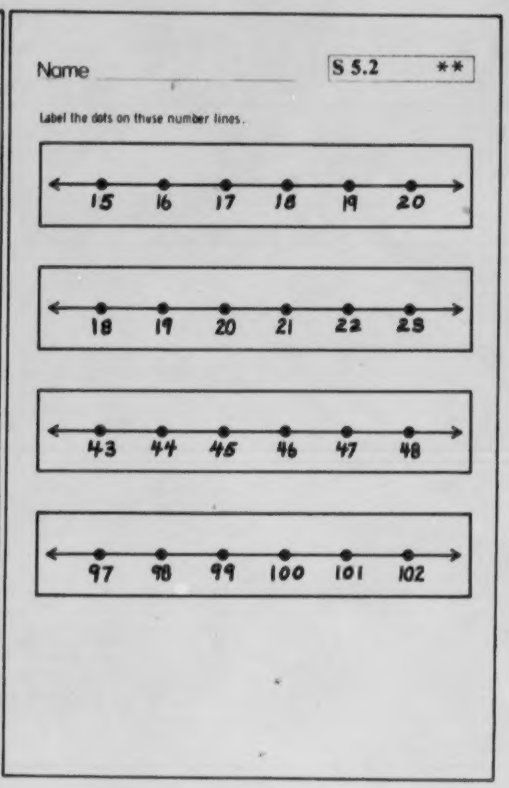
Label the dots on these number lines.

0 1 2 3 4 5

5 6 7 8 9 10

7 8 9 10 11 12

10 11 12 13 14 15



Name

S 5.2 **

Label the dots on these number lines.

15 16 17 18 19 20

18 19 20 21 22 23

43 44 45 46 47 48

97 98 99 100 101 102

S 6

S6.1 Addition Problem #2

CAPSULE LESSON SUMMARY

Put numbers on the Minicomputer and read numbers on the Minicomputer. Use the Minicomputer to calculate the cost of the ingredients of a birthday cake.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Begin this lesson with five or ten minutes of recognizing and putting numbers on the demonstration Minicomputer.

T: Who would like to put my secret number on the Minicomputer?

Whisper your number to a volunteer, choosing a number of appropriate difficulty for the student. When the number has been put on the Minicomputer, continue.

T: Who knows the secret number?

Ask a student to write the appropriate numerals under the Minicomputer boards; then, ask the first student if this, indeed, was the secret number. Repeat several times with other secret numbers, and then continue.

T: Mike (substitute the name of a student in your class) has decided to bake a cake for his mother's birthday, so he needs to buy some things at the store. Here is a list of what he needs to buy.

Cake Mix	61¢
Milk	45¢
Eggs	89¢

T: Mike wants to know the total cost of these items. What calculation should he write?

Choose a volunteer to write either of the following calculations on the board.

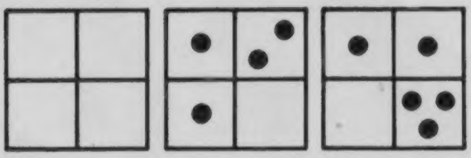
$$\begin{array}{r} 61 \\ 45 \\ +\ 89 \\ \hline \end{array} \qquad \text{or} \qquad 61 + 45 + 89 =$$

T: What will be the total cost of these items? ($1.95) Who has a good guess?

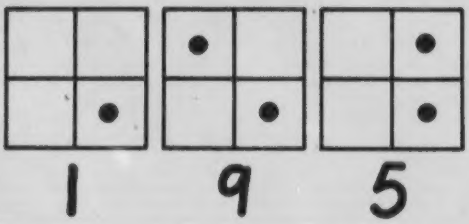
Record several guesses on the board. If any students guess correctly, ask later how they found the correct answer.

T: Let's do this calculation on the Minicomputer, to be sure.

Ask students to progressively put the three numbers on the Minicomputer. If standard configurations are used, the Minicomputer will look like this.



Ask various students to make plays. When the number on the Minicomputer is shown in its standard configuration, ask a student to write the appropriate numerals under the Minicomputer.



S 6

T: What will be the total cost of the cake ingredients?

S: 195¢.

S: $1.95.

T: Who knows how to write "$1.95", as is done in stores?

Choose a volunteer to write this on the board.

$1.95

S6.2 "A Parade of Problems #1"

CAPSULE LESSON SUMMARY

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on.

MATERIALS

Teacher: None
Student: "Parade of Problems #1" workbook; colored pens, pencils, or crayons

DESCRIPTION OF LESSON

NOTE: This is the second lesson using the "Parade of Problems #1" workbook. The first lesson was in Part I of the First Grade Program.

Distribute the students' copies of "Parade of Problems #1". Instruct students to begin by correcting or completing those pages indicated by you on the workbook cover. Demonstrate this by discussing your checking method and turning to a page which requires corrections or completion.

When students have finished correcting or completing pages, they should continue in the workbook for the remainder of the period.

Collect and check the workbooks.* This is the last time this particular workbook is scheduled, but you may want to have students work on pages which require corrections at a later time. If so, be aware that not all students should be required to complete the workbook. As mentioned earlier, the difficulty of the problems increases and students who are pushed beyond their abilities may become frustrated.

On the average, about two-thirds of your class should complete through page 10 of the workbook; about one-third should complete through page 20; and a few students may finish the book completely.

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* Answers for the workbook pages may be found following Lesson F73 (see pages 514-521) of the CSMP Mathematics for the First Grade, Part I, Teacher's Guide.

S 7

S7.1 Transforming a Number #1

CAPSULE LESSON SUMMARY

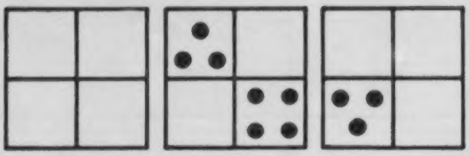
Estimate a number which has been put on the Minicomputer with many checkers. Move checkers in various ways, each time observing whether the move changes the number on the Minicomputer (smaller or larger), or leaves the number unchanged. Make plays to decide which number is on the Minicomputer and compare it to the estimates.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Put the following configuration of checkers on the Minicomputer[*].



T: What number have I put on the Minicomputer?

The students will probably suggest making some plays before telling you what number this is.

T: By making some plays, we can read this number more easily; but before making any plays, let's estimate. Is this number more than 50? How do you know?

S: Yes; because there is a checker on the 80-square.

---

[*] Checkers of three colors should be used here. Use yellow in place of the "black" checkers in this picture.

T: Is this number more than 80? How do you know?

S: Yes; because there are three checkers on the 80-square.

T: Is this number more than 100? (Yes) Can someone point to checkers for 100?

A student might point to one checker on the 80-square and two checkers on the 10-square.

T: 80 + 10 + 10 = 100; so this number is more than 100. Is it more than 200? (Yes) Can someone point to checkers for 200?

A student might point to two checkers on the 80-square and four checkers on the 10-square and you could than demonstrate that 100 + 100 = 200. However, if no one can indicate checkers for 200, you should repeat the question: "Is the number more than 200?" You may wish to say simply that it is uncertain whether or not the number is more than 200.

T: Now, watch very carefully. I am going to do something with these checkers. You must tell me if I change the number or not.

Very obviously, move a checker from the 10-square to the 2-square.

T: Did I change the number? (Yes) Is it more or less than before? (Less) Why?

S: Because you moved a checker from the 10-square to the 2-square; and 2 is less than 10.

T: If I leave the checkers this way, the number won't be the same; so I'll move this checker back to the 10-square.

S 7

After returning the checker to its original position, write these words on the board.

MORE SAME LESS

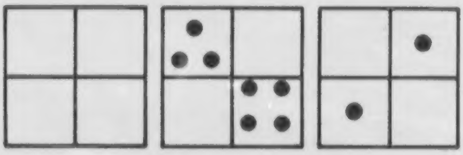
T: I will do something with these checkers, and then I will point to each of these words. When I point to the correct word, raise your hands.

Very obviously, move a checker from the 80-square to the 100-square. Point to each word. The students should raise their hands when you point to the word "MORE". If many of the students do not realize that the new number is more than the original one, repeat the move very obviously and give the students another opportunity to describe the new number. Ask a student who answered correctly to explain why the number is more.

T: If I leave this checker on the 100-square, the number is larger than before; so I'll move the checker back to the 80-square.

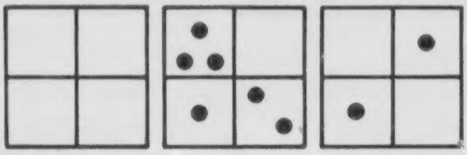
Very dramatically, make a "2 + 2 = 4" play and as before, point to each word on the board. If many students believe, incorrectly, that the number has changed, return the two checkers to the 2-square and make the play again. Give the students another opportunity to describe the number. Ask a student who answered correctly to explain why the number is the same as the original.

T: The play I made didn't change the number, so I can leave these checkers where they are.



Continue this activity using the following moves. Whenever the movement changes the number, be sure to return the checkers to their previous position before continuing.

- Move a checker from the 80-square to the 8-square.
- Replace one of the checkers on the 10-square with a checker of a different color.
- Remove one checker from the 80-square and one checker from the 2-square, and put a checker on the 10-square.
- Make a "10 + 10 = 20" play.



T: Do we still have the same number as when we started? (Yes) I've moved some of the checkers, but we've been very careful not to change the number. What did we estimate this number to be?

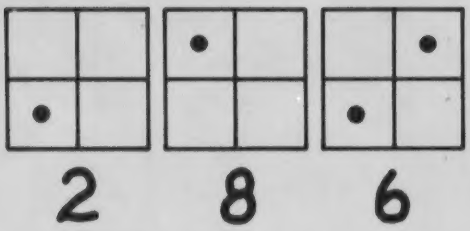
Some classes will have estimated the number to be more than 200; other classes may have been less certain. Allow several students to guess the number and record their guesses on the board.

T: Let's make some plays to find out what is this number. Be sure that the plays you make don't change the number.

If no one suggests the "80 + 20 = 100" play, suggest it yourself. The students should be able to make the remaining plays without much difficulty.

Ask one of the students to write the appropriate numerals below the Minicomputer.

S 7



Determine which guess was closest to 286.

S7.2 The Functions +3 and -3

CAPSULE LESSON SUMMARY

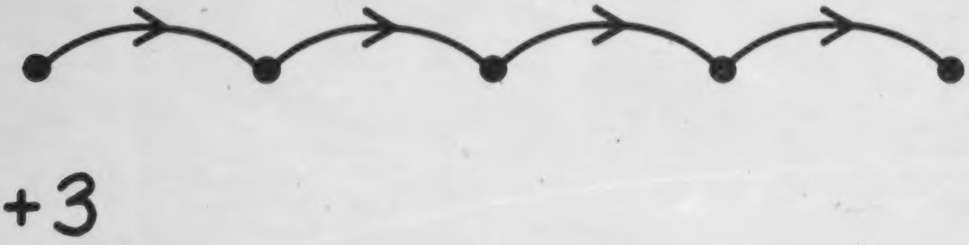
Label the dots in a +3 arrow picture and draw return -3 arrows. Write a number story about each arrow, its starting dot and its ending dot.

MATERIALS

Teacher: Colored chalk
Student: Colored pencils; paper

DESCRIPTION OF LESSON

Draw the following arrow picture on the board and ask the students to copy it on their papers.

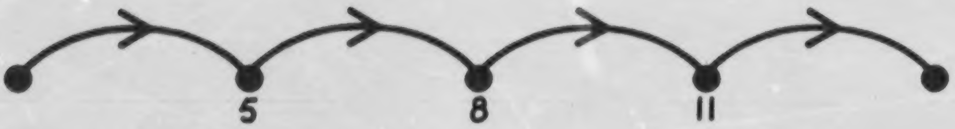


When all of the students have at least two arrows drawn, point to the second dot from the left and label it "5". Then, point to the third dot from the left.

T: What number goes here? How do you know?

S: 8; because 5 + 3 = 8.

Let a student explain how to calculate "5 + 3". Label the dot "8" and invite someone to write the number story on the board. Encourage the students to write this number story on their papers. Follow this same procedure for the next dot to the right.



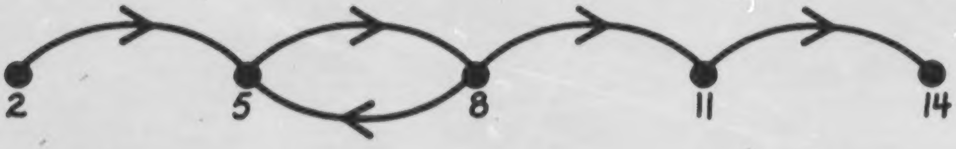
+3

8 + 3 = 11

5 + 3 = 8

Ask the students to label the two remaining dots and to write the appropriate number stories on their own. Assist any students who require help before you continue collectively. Send students to the board to complete the arrow picture and to write the appropriate number stories.

T: I will draw a blue arrow in this arrow picture; what could this arrow be for?



+3

2 + 3 = 5 8 + 3 = 11

5 + 3 = 8 11 + 3 = 14

Encourage the class to offer suggestions and to consider each suggestion carefully. Someone may suggest "take away 3" or "minus 3". If someone suggests "is more than", you should reply that the blue arrow could be for "is more than," but that you have something else in mind for this blue arrow.

T: 8 - 3 = 5. The blue arrow is for - 3.

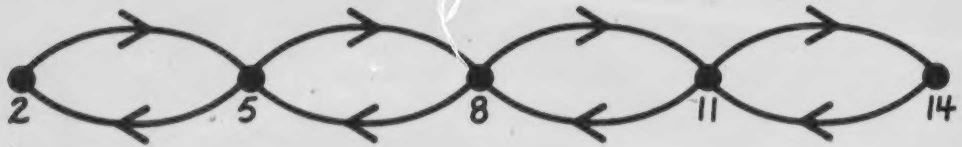
On the number line, with your fingers, or by some similar method, demonstrate that "8 - 3 = 5." In blue, write "- 3" near the arrow picture and ask the students to do so on their papers.

T: Could we write a number story about this blue arrow?

If students suggest "5 + 3 = 8", remind them that they already wrote this number story about one of the red arrows. If no one suggests "8 - 3 = 5", suggest it yourself and ask a volunteer to write this number story on the board.

T: Where could we draw another blue arrow?

As students suggest correct blue arrows, draw them in the picture on the board and ask the students to copy them in their pictures. Let volunteers write the appropriate number stories on the board. Continue until the arrow picture is completed.



+3 -3

2 + 3 = 5
5 + 3 = 8

8 + 3 = 11
11 + 3 = 14

5 - 3 = 2
8 - 3 = 5

11 - 3 = 8
14 - 3 = 11

S 8

S8.1 Multiplication Problem #1

CAPSULE LESSON SUMMARY

Using the Minicomputer, decide how many bananas a monkey trainer needs if he puts 17 bananas in each of five bags.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Tell the following story, or one similar to it, to your class.

T: Mr. Moore is the monkey trainer for a circus. He has 17 lively monkeys which can do many tricks. What kinds of monkeys could Mr. Moore have?

Allow the students to discuss this for a few minutes. Some of them may also want to describe some of the tricks monkeys can do.

T: Mr. Moore's monkeys love children. Often, Mr. Moore invites some children to feed them. What do you think would be the favorite food of Mr. Moore's monkeys?

Allow the students to offer some suggestions.

T: The favorite food of Mr. Moore's monkeys is bananas. He takes a bag for each child, counts out 17 bananas very carefully and puts them in the child's bag. Why would Mr. Moore put exactly 17 bananas in each bag?

S: Because there are 17 monkeys. Each monkey will get one banana from a child's bag.

T: Mr. Moore has invited five students from our class to feed his monkeys. Who would like to feed Mr. Moore's monkeys?

Choose any five volunteers.

T: Mr. Moore is preparing a bag of bananas for each of you. How many bananas will Mr. Moore need in all, if he puts 17 bananas in each bag?

Allow students to make predictions, and record some of these predictions on the board.

T: How can we find out exactly how many bananas Mr. Moore will need?

Someone may suggest using the Minicomputer.

T: What calculation should we do on the Minicomputer?

If someone suggests "17 + 17 + 17 + 17 + 17", accept this as correct and record it on the board, but ask if there is a shorter way to write the calculation. If no one suggests "5 x 17", suggest it yourself.

Write "5 x 17 =" on the board. Ask each of your five volunteers to put 17 on the Minicomputer. Invite other students to make plays on the Minicomputer, until the standard configuration for the solution (85) is obtained. Complete the number stories on the board and conclude that Mr. Moore will need 85 bananas in all.

S 8

S8.2 Counting by Tens #1

CAPSULE LESSON SUMMARY

Count by tens with some students each holding up ten fingers. Repeat the activity, but begin counting at 4. Record these numbers in a +10 arrow picture.

MATERIALS

Teacher:	0 - 109 Numeral Chart; colored chalk
Student:	None

DESCRIPTION OF LESSON

Ask all the students in one row to raise both hands with fingers extended. Explain that you will use their fingers to count by tens. Proceed down the row or around the table, holding up each succeeding student's hands, while the class counts in unison by tens.

Ask a student to stand in front of the room and to hold up four fingers.

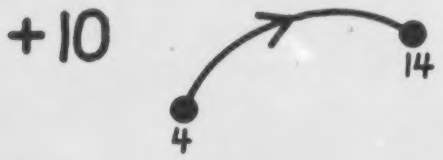
T: We have four fingers here. Who else would like to come up to the front, and hold up all of his or her fingers?

Choose a volunteer to join the first child.

T: How many fingers did we have at first? (Four)
How many fingers did we add to these? (Ten)
How many fingers are raised all together?

S: 14.

Begin this arrow picture on the board.



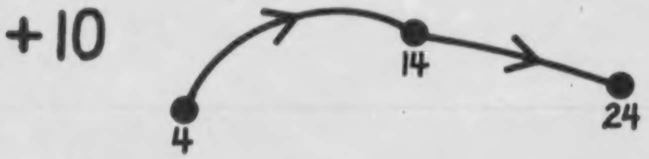
T: We started with four fingers (point to the dot labeled "4"). We added ten fingers (trace the arrow), and now have 14 fingers (point to the dot labeled "14").

Ask a third student to join the other two at the front of the class, and to hold up all ten fingers.

T: We had 14 fingers and we add 10. How many fingers are raised now?

S: 24.

Add a second red arrow to your drawing.



T: We had 14 fingers (point to the dot labeled "14"). We added ten fingers (trace the arrow) and got 24 fingers (point to the dot labeled "24").

Ask someone to find "4", "14", and "24" on the 0-109 Numeral Chart. Emphasize the fact that 4 is four ones; that 14 is one ten plus four ones; and that 24 is two tens plus four ones.

Continue until the arrow picture includes dots for 54 or 64. If the students remain interested and some time remains, you may wish to repeat the activity, beginning this time with seven fingers.

S 9

S9.1 The Numbers Speak

CAPSULE LESSON SUMMARY

Review the "less than" and "more than" relations. Name some friends 14 might play with in an "I am less than you" arrow picture and label the dots accordingly. After all the dots have been labeled, decide where to draw other "I am less than you" arrows.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

Exercise 1

Tell your class that you are going to play a game and that they should not answer unless you point to them. Below is a sample dialogue.

T:	3 is less than . . . ?	S:	5.
	5 is less than . . . ?	S:	9.
	9 is less than . . . ?	S:	10.
	10 is less than . . . ?	S:	11.
	11 is less than . . . ?	S:	12.
	12 is less than 19, and		
	19 is less than . . . ?	S:	50.
	50 is less than . . . ?	S:	100.
	100 is less than . . . ?	S:	200.
	200 is less than . . . ?	S:	1,000,000.
	1,000,000 is less than . . . ?	S:	1,000?

T: No, 1,000,000 is not less than 1,000. 1,000,000 is less than . . . ?

S: 2,000,000.

If your students begin to give consecutive numbers, you should give a skip count to encourage them to feel unrestricted. You may want to ask a student to write one of the larger numbers on the board; or you may prefer to write it yourself. As your students begin to tire of this activity, change to an "I am more than you" game.

T: Now listen carefully.

2,000,000 is more than . . . ? S: 1,000.

1,000 is more than . . . ? S: 500.

500 is more than . . . ? S: 400.

400 is more than . . . ? S: 200.

200 is more than . . . ? S: 199.

199 is more than . . . ? S: 0.

0 is more than . . . ?

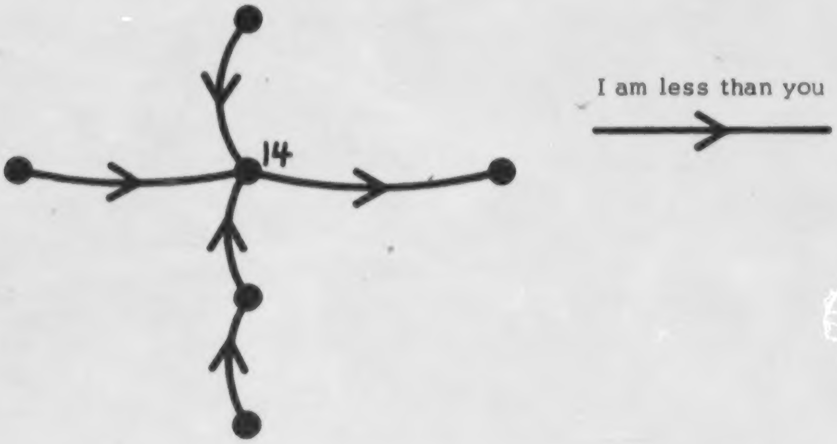
If your area of the country has experienced some sub-zero weather this winter, one of your students may answer, "two below zero" or "negative two." In this case, you might respond, "Very good; 0 is more than negative two."

If no one suggests any numbers like these, you should say simply,

T: Maybe now you don't know any numbers which are less than 0, but someday you will.

Exercise 2

Draw this arrow picture on the board.



S 9

T: These numbers are speaking to each other. What are they saying?

S: "I am less than you."

T: Who can show us a number which is saying "I am less than you" to another number?

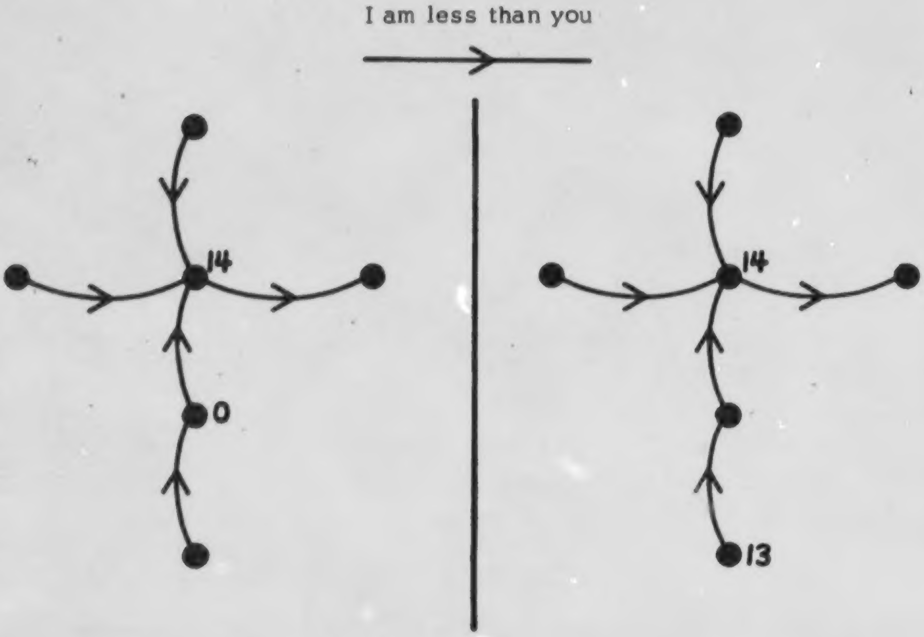
If, for example, a student points to the dot on the left, you would trace the arrow which begins at this dot and say, "This number is less than 14."

T: Today, you may choose the numbers who are playing this game with 14. Who would like to come up and label a dot?

Be sure the students understand that there is more than one correct label for each dot. When a correct answer is offered, ask the student to read that portion of the arrow picture. If, for example, the dot on the right is labeled "27", the student reads, "14 is less than 27."

Continue asking students to label dots until all of the dots have been labeled.

NOTE: It is possible for situations to develop which would require the use of numbers other than the whole numbers, as in the following examples.



For the example on the left, first graders may not be aware of any numbers which are less than 0, and might conclude that there are no such numbers. In this case, simply say, "You don't yet know any numbers which are less than 0." If a student does suggest such a number, such as "one below zero", accept this answer as correct and label the dot "$\hat{1}$", but do not emphasize this. Do not erase this picture, but draw the same arrow picture again to one side of the first one and begin again.

For the example on the right, first graders may not be aware of any numbers which are both more than 13 and less than 14, and might conclude that there are no such numbers. In this case, you should simply say, "You don't yet know any numbers which are between 13 and 14." If a student does suggest such a number, for instance $13\frac{1}{2}$, accept this as correct and label the dot "$13\frac{1}{2}$", but do not emphasize it. Do not erase this picture, but draw the same arrow picture again to one side of the first one and begin again.

If a student wishes to label two dots with the same number, say (for example) "This dot is for 6; what could this other dot be for?"

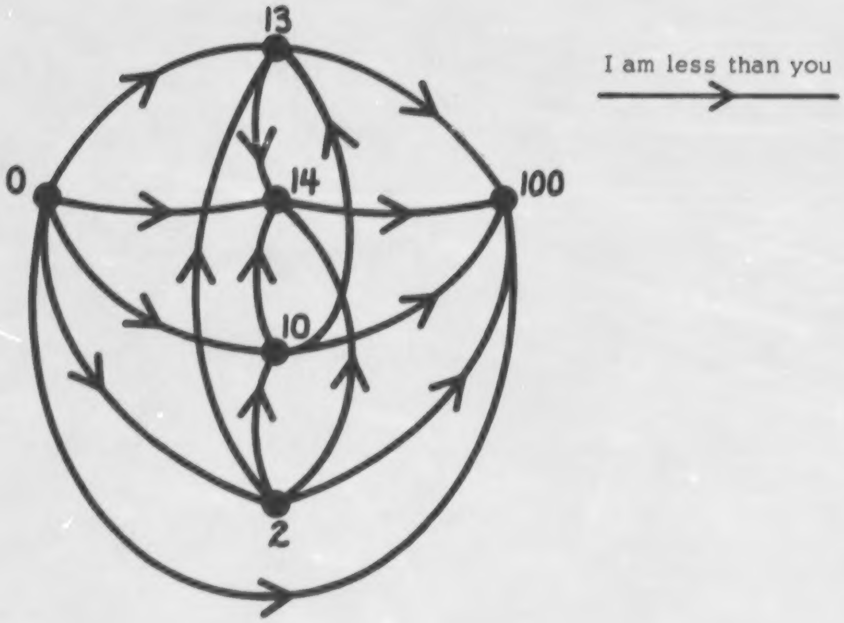
Continue until all of the dots have been labeled.

T: Could we draw any more red arrows?

Invite volunteers to do so. As each arrow is drawn, let a student read it to the class. The picture will become complicated very quickly.

Do not expect the students to find all of the possible arrows. For your information only, a completed picture is shown on the next page.

S 9



S9.2 Taxi-Geometry

CAPSULE LESSON SUMMARY

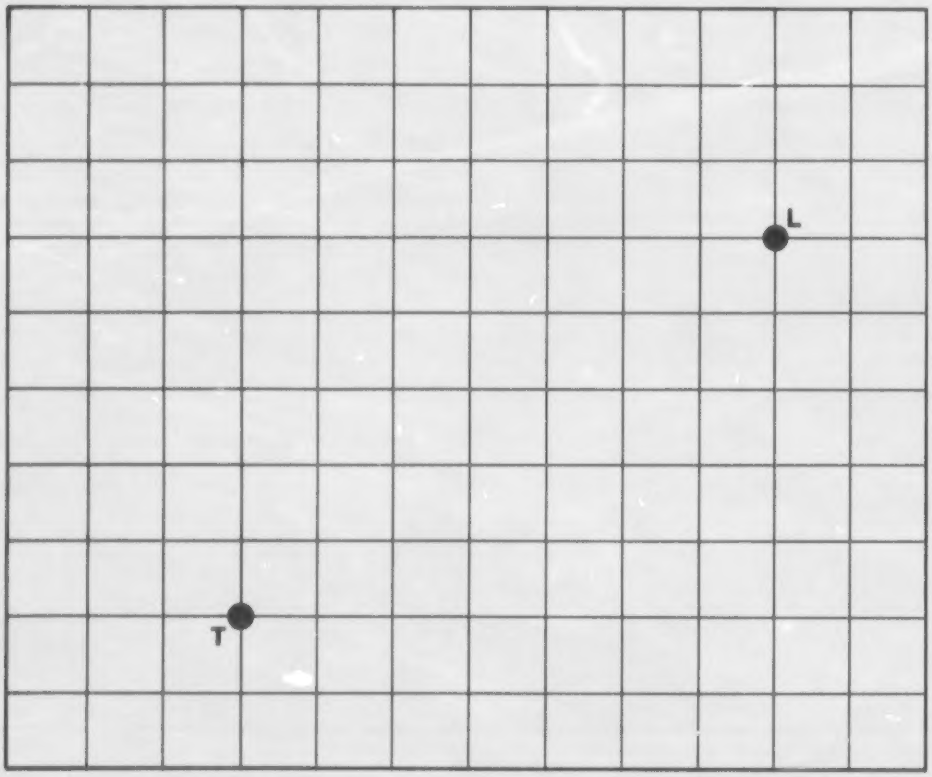
Draw two different taxi-geometry paths between two points on a grid board and then compare their lengths. Measure by counting the number of blocks in each path.

MATERIALS

Teacher: Grid board* ; colored chalk
Student: Colored pencils ; Worksheet S9.2

DESCRIPTION OF LESSON

On a grid board, draw and label two dots as illustrated below.



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* Newsprint grid posters, which are included with CSMP classroom materials, may also be used for this lesson.

S 9

T: This is a map of the city where Tina lives. Who can show me where Tina lives?

S: At T.

T: Who remembers what "L" is for?

S: The library.

Moving your finger along any lines, remind the class that the lines on the grid are the streets of Tina's city. Point out that Tina always follows the streets when she walks to the library, because she knows it is impolite to walk across other people's yards.

Invite a student to trace a path from T to L, using a pointer or finger. Accept any suggested path which follows the lines. If necessary, repeat your explanation that the lines of the grid board are the streets of the town.

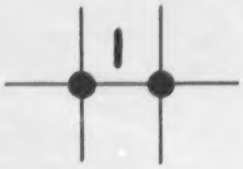
Invite other students to also trace paths from T to L on the grid board. If the paths are correctly traced and not especially long, use different colors of chalk to draw them in. Continue until two different paths are drawn on the board.

T: Here we have two different paths to the library which Tina could take. Which path do you think is the longer?

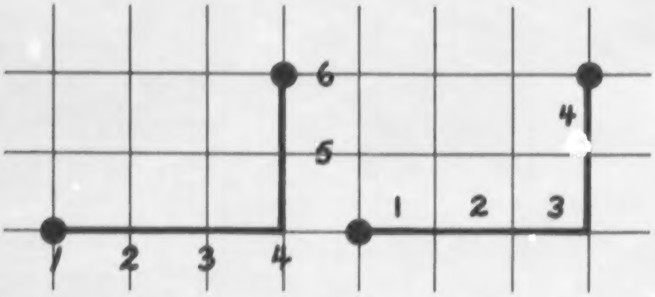
Allow the students time to express their opinions.

T: Why do you think this path is the longer of the two?

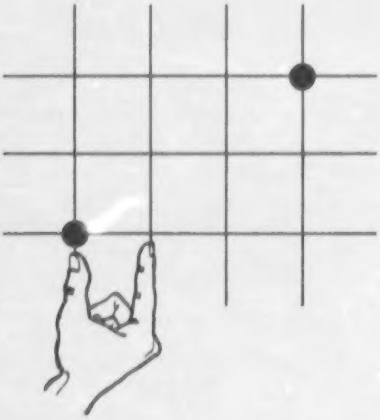
If no one suggests counting the blocks, suggest it yourself. In a top corner of your grid board, indicate the length of "one block".



NOTE: Some very common mistakes can occur when students count the blocks in a path, especially when turning a corner. The next illustration, for instance, shows two common counting errors.



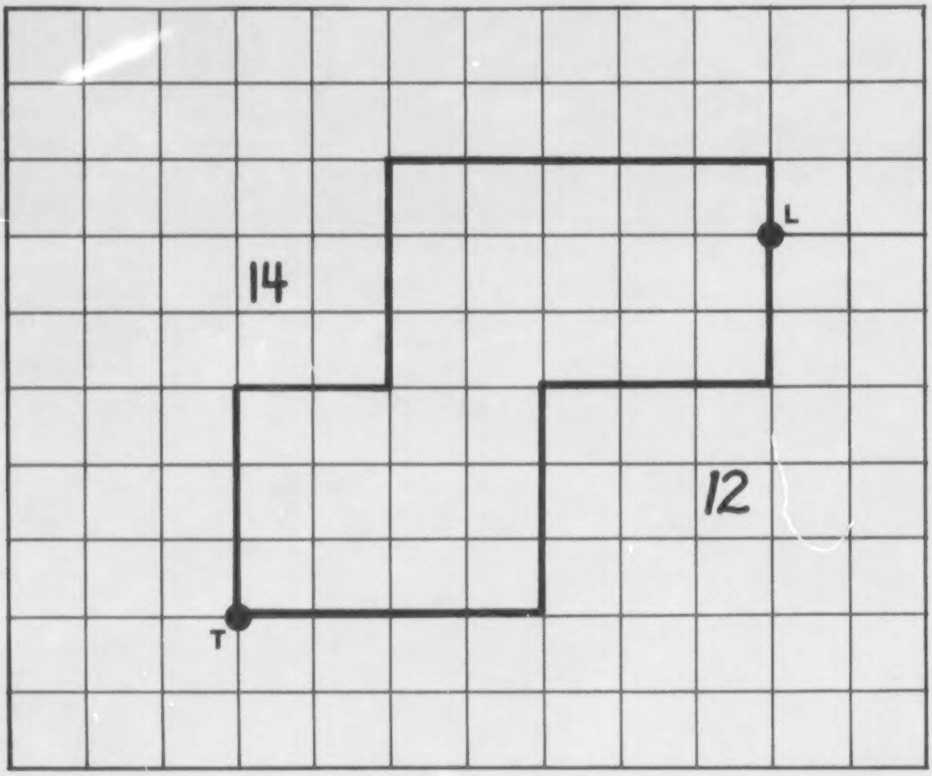
Both paths in the illustration above are, in fact, five blocks long. To avoid such mistakes, it may be helpful to have the students show each block with their thumb and index finger as they count. This technique is illustrated below.



S 9

Let students measure the two paths on your grid board to determine which path is the longer. Pay close attention to each student's counting technique and make corrections where necessary.

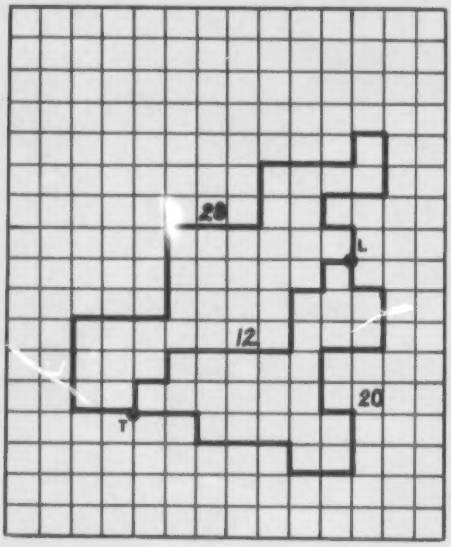
Record the number of blocks in each path in the color of that path, as shown in this illustration.



Distribute copies of Worksheet S9.2 and ask the students to draw a variety of paths from T to L. Each path should be drawn in a different color. Ask the students to count the number of blocks in each path and record this number next to the path on their worksheet.

Students who finish quickly can proceed to the second page of this worksheet. As the students work individually, circulate around the room, offering assistance where necessary. Some counting errors may be easily spotted because: all paths from T to L should be an even number of blocks in length.

Name ____________________ S 9.2



Many solutions are possible, but the length of every path will be an even number of blocks.

S10 Adjustment Day #1

NOTE: See page 16, Section One NOTES TO THE TEACHER in CSMP Mathematics for the First Grade, Part I for a full explanation of the purpose of scheduled adjustment days.

On this day you may wish to repeat a previous lesson, either for a small group of students or for the entire class. Often the basic content of a particular lesson can be made to appear completely different by adjusting a story line and/or the numbers in a story. Consider the needs of your class in choosing lessons to repeat.

You may wish to include activities for students who need extra help. The Adjustment Days in Part I provide examples of such activities.

If your class is experiencing little difficulty with the CSMP curriculum, you may prefer to omit this adjustment day and continue immediately with S11 Estimation and an Addition Problem #1.

EARLY WARNING!

Among the next nine classroom lessons are some which require extra preparation time, or which involve materials not included with the CSMP classroom set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more than once during the nine-day period.)

S11 Estimation and an Addition Problem #1: transparent jar containing 100-150 dried beans, dried peas, beads, or something similar; small strips of paper for students.

S15.1 Hidden Dots: large piece of paper or cardboard; ruler

S15.2 Coin Problem #1: small, opaque container; six nickels

S18.2 A Game with A-Blocks #2: (Materials for playing this game are provided in the A-Block String Game kit, but you should see APPENDIX: The String Game, p. 457, for a complete description of equipment and preparation required for the game.)

S11 Estimation and an Addition Problem #1

CAPSULE LESSON SUMMARY

Estimate how many beans are in a jar. Take the beans out in handfuls, and count and record the number of beans in each handful. Use the Minicomputer to do the resulting addition problem. Decide which estimates were closest to the actual number of beans.

MATERIALS

Teacher:	Transparent jar (containing 100 – 150 dried beans, dried peas, beads or something similar); Minicomputer set
Student:	Small strip of paper

DESCRIPTION OF LESSON

Distribute strips of paper and tell each student to write his or her name on the strip. Walk around the classroom, displaying the jar and its contents to the students.

T: On your pieces of paper, write the number of beans (or peas, beads, etc.) you think are in the jar. Don't let anyone see your guess. When you have written your guess, fold your paper to hide your guess.

Collect the strips of paper and arrange them from the smallest guess to the largest. (First, separate the guesses into stacks for those in the teens, twenties, etc.; then, order the guesses within each stack.) Record the guesses, on the board, in order.

T: Let's use the Minicomputer to help us find how many dried beans there are in the jar.

Take out a handful of beans, count them with the class and put these beans aside. Record this number on the board and ask a student to put the number on the Minicomputer. Repeat this with a second handful. Write a plus sign (+) between your two numbers on the board, since you will be adding the numbers together.

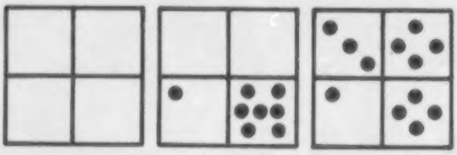
S 11

Continue in this manner until the jar is empty. The following discussion assumes that there are 136 beans in the jar, and 27 students in the class.

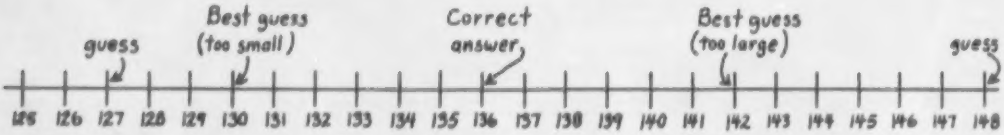
CLASS GUESSES

47
48
52
60
63
81
84
85
90
94
99
100
100
100
106
110
127
130
142
148
150
180
200
300
500
500
1,000

$$16 + 18 + 15 + 21 + 14 + 15 + 19 + 18 =$$



Invite volunteers to make plays on the Minicomputer to find the total (in this case 136). Discuss which guess was the best one. In this example, there are two best guesses; 130 is six too small and 142 is six too large. You may find the number line useful during this discussion for purposes of illustration.



You may wish to give a prize to the student(s) who made the best guess(es).

S12 A Snake with 2 x and + 3

CAPSULE LESSON SUMMARY

Put and read numbers on the Minicomputer. Write appropriate numerals under the Minicomputer boards. Label the dots in an arrow picture which has 2 x and + 3 arrows.

MATERIALS

Teacher: Minicomputer set; colored chalk
Student: Colored pencils; paper

DESCRIPTION OF LESSON

Exercise 1

Begin this lesson with five to ten minutes of putting and recognizing numbers on the Minicomputer.

T: Who would like to put my secret number on the Minicomputer?

Whisper a number to a volunteer, choosing a number of appropriate difficulty for that student. When the student has put the number on the Minicomputer, continue.

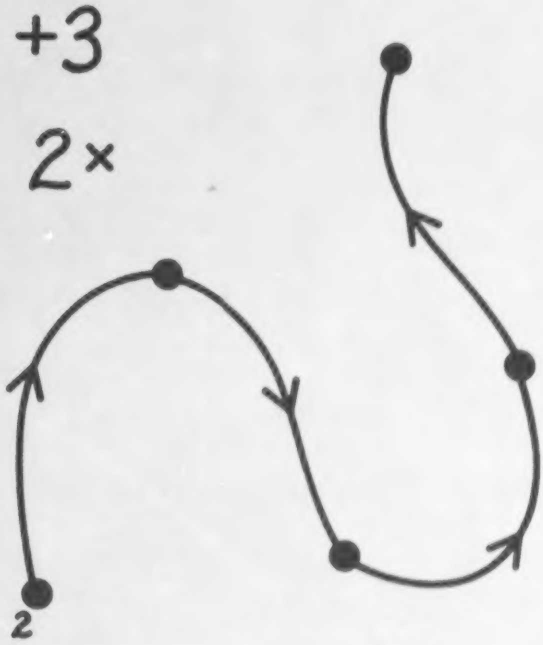
T: Who can write this number below the Minicomputer?

When the appropriate numerals have been written on the board, ask the first student if that, indeed, is the secret number.

Repeat this activity several times before continuing with the next exercise.

Exercise 2

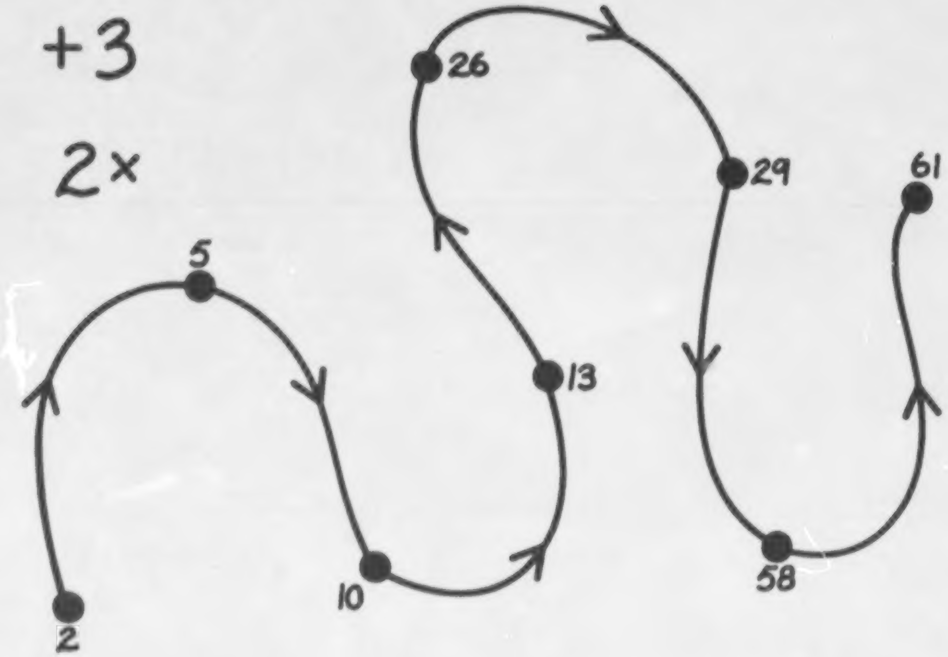
Draw the following arrow picture on the board and ask the students to copy it on their papers.



Label the dots in this arrow picture with student assistance. Instruct students to follow along by labeling the dots in their pictures. If no student suggests using the Minicomputer to calculate "2 × 13", suggest it yourself.

When the dot for 26 has been labeled, extend the "snake" by adding another red arrow. You may wish to hold up three fingers and count, "27, 28, 29" to calculate the number at the ending dot. Other methods include counting three to the right on the classroom number line or 0-109 Numeral Chart.

Continue to draw alternating red and blue arrows until the dot for 61 is reached.



If your class remains interested, you may wish to extend this arrow picture with a few more arrows; or, some of the students may wish to continue on their own. Encourage them to do so during free time and suggest that they use individual Minicomputers to calculate the numbers. (Students may wish to continue to draw alternating colored arrows or they may prefer to invent their own combinations of red and blue arrows.)

S 13

S13.1 Fair Distribution #2

CAPSULE LESSON SUMMARY

Inside a string, draw dots for some candies; inside another string, draw dots for two children. Use arrows to show how to divide the candies fairly between the children.

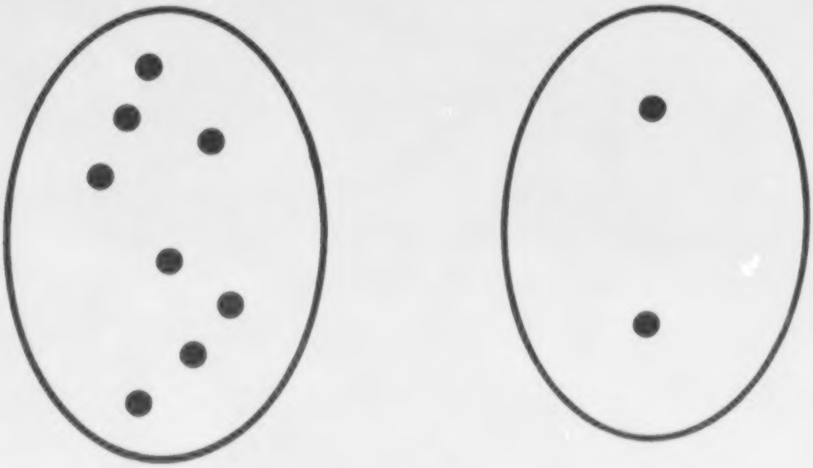
MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

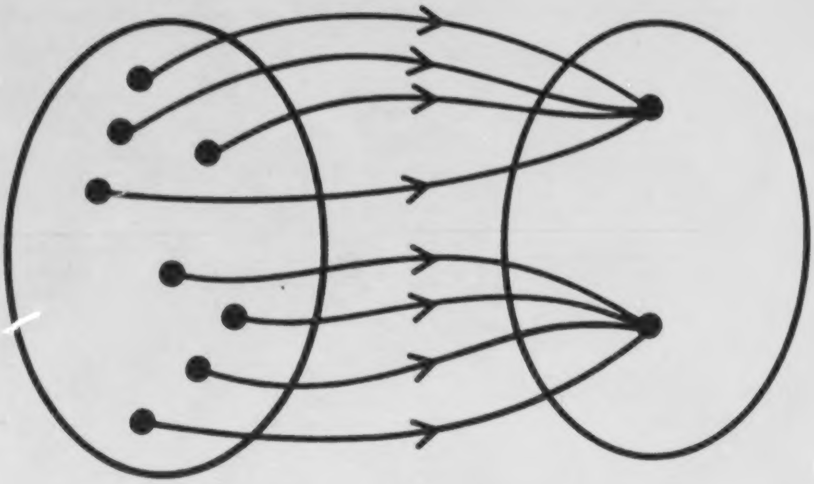
T: Suppose I have eight pieces of candy and I want to give them to Erin and Ricky (substitute the names of two students in your class). I want to give both Erin and Ricky the same number of pieces.

Draw this string picture on the board.



T: The eight candies are in the red string, and Erin and Ricky are in the blue string.

Invite students to draw arrows for distributing the candies.

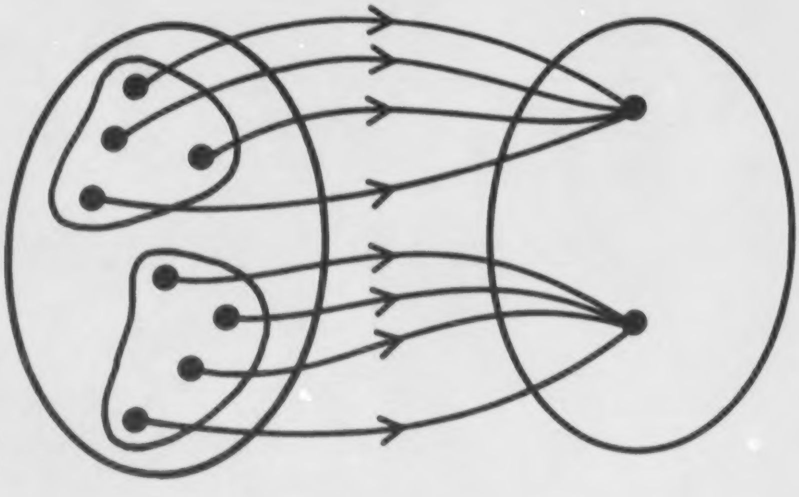


T: How many candies does Erin receive? (Four)

How many candies does Ricky receive? (Four)

Did they both receive the same number of candies? (Yes)

Call on students to draw a string around the candies Erin receives and another string around the candies Ricky receives.



S 13

T: Erin and Ricky both received the same number of candies. Erin got one half of the candies, and Ricky got one half of the candies. One half of eight candies is four candies.

Write this number story on the board.

$$\frac{1}{2} \times 8 = 4$$

S13.2 Magic Squares #1

CAPSULE LESSON SUMMARY

Look at an array of numbers and discover that the sum of the numbers in any row, column, or diagonal is 30.

MATERIALS

Teacher: Minicomputer set
Student: Worksheets S13.2* and **

DESCRIPTION OF LESSON

Draw this magic square on the board.

11	6	13
12	10	8
7	14	9

T: This is a magic square; try to figure why it is magic. What numbers do you see in the first row of this magic square?

You may need to explain what is meant by "row".

S: 11, 6, and 13.

T: Let's use the Minicomputer to add these three numbers.

Ask volunteers to assist in doing the calculation on the Minicomputer.

T: What number story can we write about this calculation?

S:	"11 + 6 + 13 = 30".

Record this number story to one side of the magic square and remove all checkers from the Minicomputer.

T:	Let's add the three numbers in the second row.

Continue in this manner, adding the three numbers in each row and column (and recording the appropriate number stories on the board) until all six have been calculated. The students will probably discover very early that the sums are identical.

T:	This square is magic in another way. Let's add these three numbers.

Indicate the numbers along one of the diagonals. Invite a student to add these numbers on the Minicomputer and then to record the appropriate number story. Repeat this activity with the other diagonal, and conclude that the sums of the numbers in every row, column, and diagonal are always the same.

11	6	13
12	10	8
7	14	9

$$\left.\begin{array}{l} 11 + 6 + 13 = 30 \\ 12 + 10 + 8 = 30 \\ 7 + 14 + 9 = 30 \end{array}\right\}\text{Rows}$$

$$\left.\begin{array}{l} 11 + 12 + 7 = 30 \\ 6 + 10 + 14 = 30 \\ 13 + 8 + 9 = 30 \end{array}\right\}\text{Columns}$$

$$\left.\begin{array}{l} 11 + 10 + 9 = 30 \\ 7 + 10 + 13 = 30 \end{array}\right\}\text{Diagonals}$$

Distribute Worksheets S13.2* and ** and instruct the students to determine if the square on Worksheet S13.2* is a magic square (it is). Allow them to work independently for some time while you copy the square on the board.

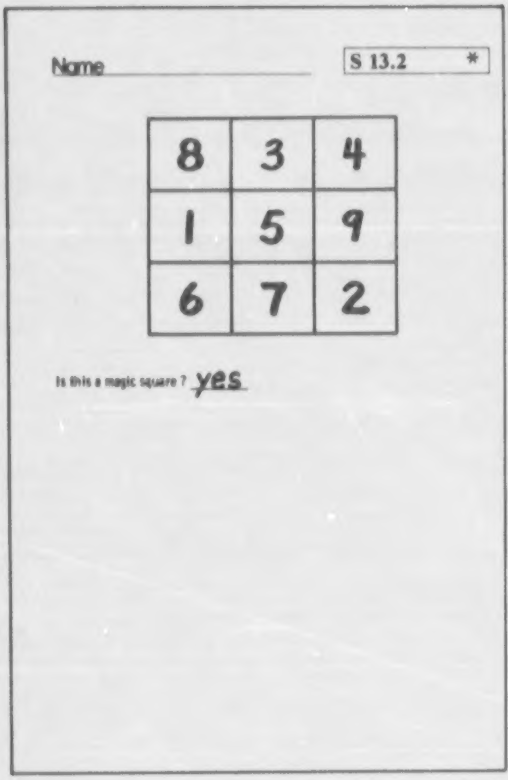
8	3	4
1	5	9
6	7	2

Soon the students will be offering their decisions.

T: Who thinks that this square is magic? Why?
Who thinks that it is not magic? Why not?

Students might reply that the sum of one of the rows, columns, or diagonals does not equal 15. Ask which one it is and add the three numbers on the Minicomputer. If there is another row, column or diagonal in question, check this sum also. Continue until the students agree that the square is magic.

Allow a few minutes (either now, or later in the day) for individual work on Worksheet S13.2**.

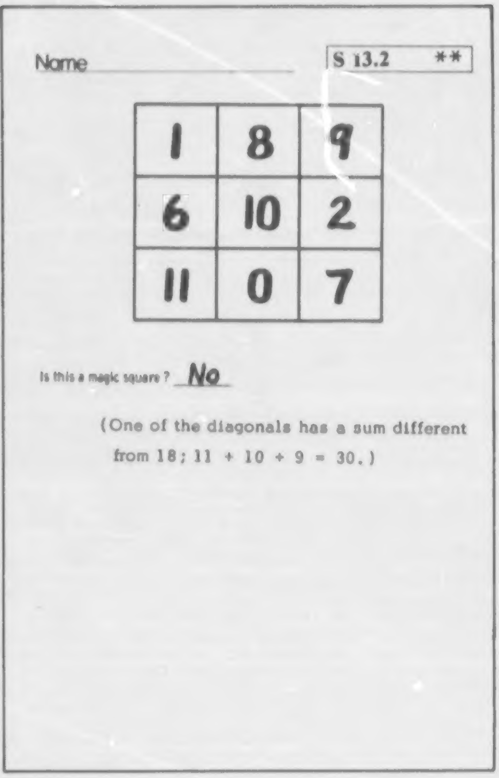


Name

S 13.2 *

8	3	4
1	5	9
6	7	2

Is this a magic square ? yes



Name

S 13.2 **

1	8	9
6	10	2
11	0	7

Is this a magic square ? No

(One of the diagonals has a sum different from 18; 11 + 10 + 9 = 30.)

S14 Counting by Tens #2

CAPSULE LESSON SUMMARY

On the Minicomputer, show that calculating " 40 + 20 " and calculating " 400 + 200 " is related to calculating " 4 + 2 ". Practice reading numerals. Count the fingers of students in each row (or at each table) by counting by tens. Use the Minicomputer to do an addition problem to decide how many fingers there are in the room.

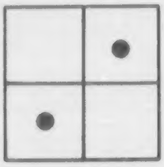
MATERIALS

Teacher:	Minicomputer set; colored chalk; 0 - 109 Numeral Chart
Student:	Colored pencils; Worksheet S14

DESCRIPTION OF LESSON

Exercise 1

Display one Minicomputer board.



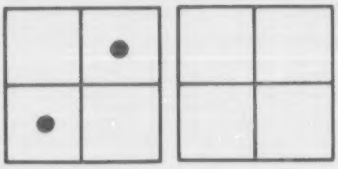
T: What number is on the Minicomputer? (6)

What number is shown in blue? (4)

What number is shown in red? (2)

Yes; 4 + 2 = 6.

Write " 4 + 2 = 6 " on the board. Without removing the checkers, add a second Minicomputer board to the right.



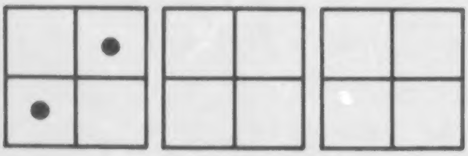
4 + 2 = 6

S 14

T: What number is on the Minicomputer now? How do you know?

S: 60, because 40 + 20 = 60.

Write "40 + 20 = 60" below "4 + 2 = 6" on the board. Add a third Minicomputer board to the right of the other two.



4 + 2 = 6
40 + 20 = 60

T: What number is on the Minicomputer now? How do you know?

S: 600, because 400 + 200 = 600.

Write "400 + 200 = 600" on the board.

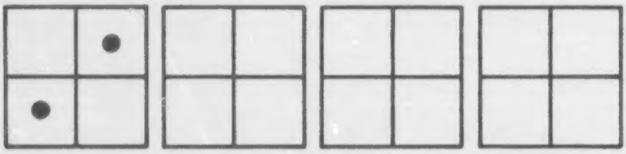
T: What number would we have if I put up another Minicomputer board?

S: 6,000.

T: What number story could we write?

S: "4,000 + 2,000 = 6,000".

Add a fourth Minicomputer board on the right.



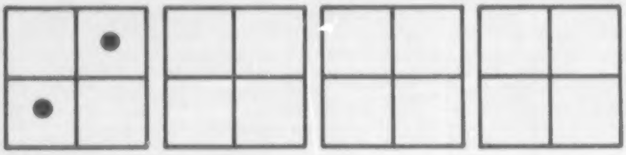
4 + 2 = 6
40 + 20 = 60
400 + 200 = 600

T: Who can write this number below the Minicomputer?

If necessary, insert the comma yourself. Explain that the comma helps to make the larger numbers easier to read.

T: Who would like to write a number story about 6,000 as we see it on the Minicomputer?

If necessary, insert the commas yourself.



6,000

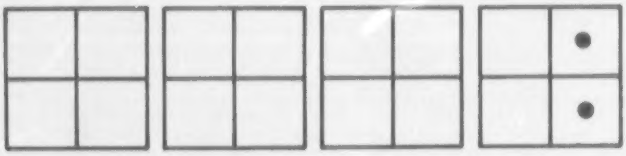
4 + 2 = 6

40 + 20 = 60

400 + 200 = 600

4,000 + 2,000 = 6,000

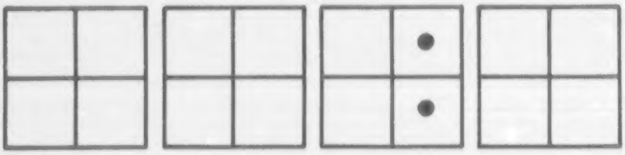
Erase the number stories and put this new number on the Minicomputer.



T: What number is on the Minicomputer?

S: 5.

Move the checkers to the corresponding positions on the tens' board.



T: What number is on the Minicomputer now?

S: 50.

Continue this activity with 500 and 5,000.

Exercise 2

Instruct the class to read together down the first column of the 0 - 109 Numeral Chart. Ask individuals to read aloud other columns of the numeral chart. Continue until each column of the chart has been read.

Exercise 3

T: How many students do we need to show 100 fingers?

S: Ten.

Ask ten students to hold up their hands and instruct the class to count these fingers, by tens, collectively.

T: Ten students have 100 fingers. How many fingers do the students in this classroom, have all together?

Allow the students to discuss this question briefly. A few students may be able to count by tens well enough to determine the answer by counting.

T: Let's count how many fingers there are in this row (or at this table) alone.

Collectively count by tens the fingers in this group of students and record this number on the board. Continue in this manner until the number of fingers for each row (or table) has been recorded.

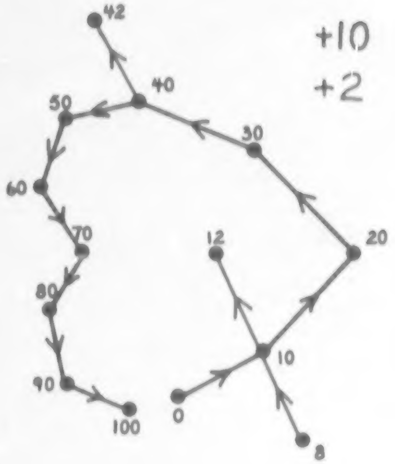
T: Now we know many fingers are in each row (or at each table). How can we calculate how many fingers there are in the room, all together?

Perhaps a student will suggest using the Minicomputer; if necessary, suggest it yourself. Invite a representative from each group of students to put the group's number on the Minicomputer. Ask volunteers to make plays, but be prepared to suggest backward plays when necessary.

Worksheet S14 is available for the remainder of the period. Explain that students are to draw all the missing +10 and +2 arrows. (Do not encourage students to draw straight arrows; arrows which do not go directly to their destinations are often aesthetically nicer than are straight arrows.)

Name ____________________ S 14

Draw all the +10 and +2 arrows.



S15.1 Hidden Dots

CAPSULE LESSON SUMMARY

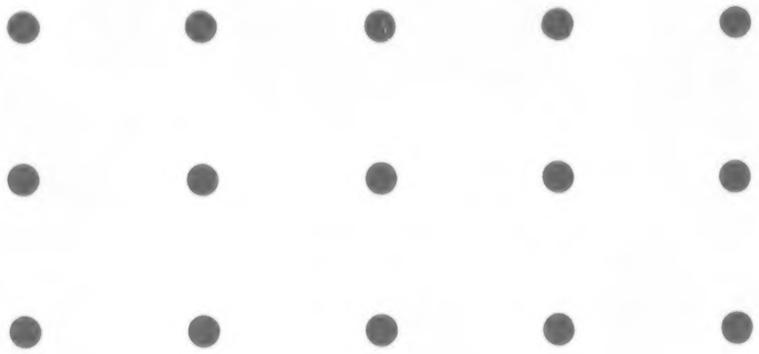
Tell number stories about an array of dots. Cover some of the dots in the array and determine how many dots are hidden.

MATERIALS

Teacher: Large piece of paper or cardboard; ruler
Student: None

DESCRIPTION OF LESSON

Draw this pattern of dots on the board. The dots should be clearly visible, yet you must be able to cover several dots with a sheet of paper.



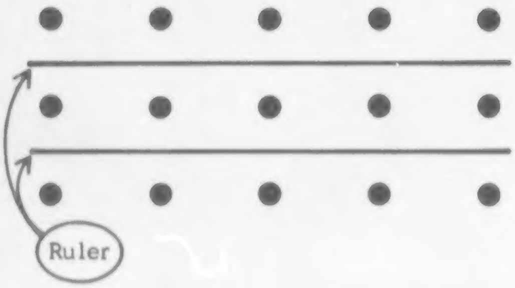
T: Look at this pattern of dots. What can you say about it?

Let the students express themselves freely. You may wish to ask how many rows and columns of dots there are.

T: Who can tell me a number story about these dots?

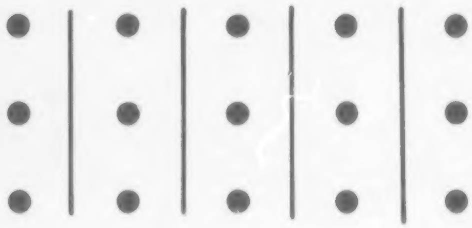
Accept and record any number story which can reasonably be associated with this pattern of dots. Use a ruler to help show the different number stories in this dot picture. Several examples are provided in the next illustration.

S 15



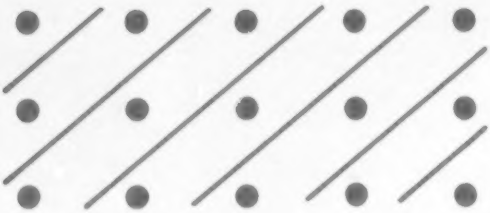
$5 + 5 + 5 = 15$

$3 \times 5 = 15$

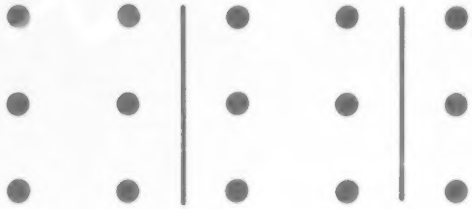


$3 + 3 + 3 + 3 + 3 = 15$

$5 \times 3 = 15$



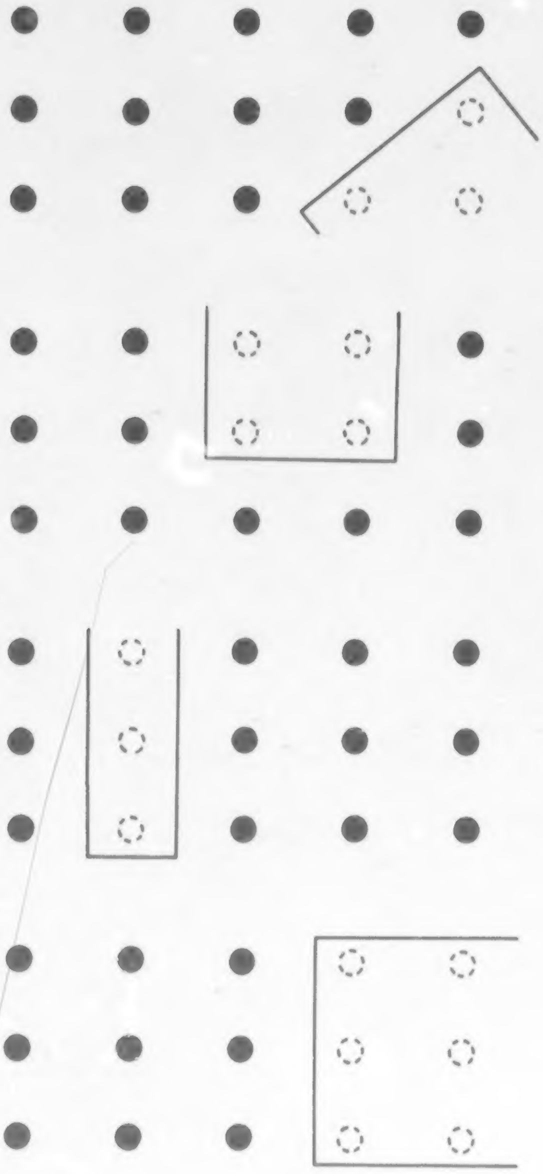
$1 + 2 + 3 + 3 + 3 + 2 + 1 = 15$



$6 + 6 + 3 = 15$

If no one suggests a multiplication number story, suggest one yourself. Continue accepting number stories for as long as you feel is appropriate.

With a sheet of paper, hide some of the dots and ask the students how many dots are hidden. Some examples are shown in the next illustration.



You could continue this activity by covering other parts of this pattern of dots or by using another pattern of dots.

S15.2 Coin Problem #1

CAPSULE LESSON SUMMARY

Given two clues, discover how much money is in a container.

MATERIALS

Teacher: Six nickels; a small, opaque container
Student: None

DESCRIPTION OF LESSON

Before the lesson begins, put six nickels into a small container. Choose a container in which the coins are not visible, but may be heard clearly when the container is shaken.

T: Today you will be detectives. You must discover how much money is in this container.

Hold up the container and shake it. Allow a few students to shake the container, also.

T: What coins could be in this container?

Accept a suggestion from a student. Suppose the first suggestion is "three dimes."

T: There _could be_ three dimes in this container. Three dimes are how many cents?

S: 30¢.

Suppose another student suggests 100 pennies. Shake the container and ask this student to shake the container, also.

T: Could there be 100 pennies in this container? (No)
Why not? (Because there aren't enough coins.)

Suppose another student suggests 27¢.

97

T: What coins could make 27¢?

Accept any correct combination of coins. Try to keep this part of the lesson moving briskly. If your class gets stuck on one particular problem (such as a combination of coins which could make 27¢), allow the problem to remain unresolved and accept another student's suggestion for the coins' identity.

When specific combinations of coins are suggested, ask how many cents each is worth. When a certain amount of cents is suggested, ask which coins could be used to have that much money. Do not record these suggestions on the board.

First clue

T: Here is a clue: all of the coins are nickels. How much money could there be in this container?

Accept some new suggestions. Continue as before, but emphasize that all of the coins are nickels.

Suppose a student suggests 27¢.

T: We can't have 27¢ with only nickels. All of the coins in this container are nickels.

Suppose a student suggests eight nickels.

T: Eight nickels are how many cents? How do you know?

S: 40¢; I counted by fives.

Hold up one finger.

S 15

T: Each finger is for one nickel. How many cents are there in one nickel?

S: 5¢.

Hold up another finger.

T: How many cents are there in two nickels?

S: 10¢.

Continue holding up fingers and counting by fives until you reach 40¢.

T: How many fingers am I holding up?

S: Eight.

T: And eight nickels are how many cents?

S: 40¢.

Continue accepting suggestions for as long as you feel is appropriate.

Second clue

T: Here is another clue: there are six coins in this container. When you know how much money is in this container, you can whisper it to me.

Accept several whispers. You may need to remind the class that all of the coins are nickels. Ask a student to answer aloud (30¢) and then reveal the coins in your container.

S16.1 Guess My Rule with Numbers

CAPSULE LESSON SUMMARY

Choose a secret rule such as "subtract 1". Ask a student for a number and then reply with a number that is one less. Continue until your rule is discovered. Repeat this activity using several other rules.

MATERIALS

Teacher: None
Student: None

DESCRIPTION OF LESSON

T: Let's pretend that I'm a computer. You will give me a number, I will do something to it, and I will give you the result.

Like any "computer" you may only change a number according to some consistent rule, such as "take away 1", which is illustrated below.

T: Tammy, give me a number.

S: 20.

T: 19.
Gordon, suggest a number.

S: 43.

T: 42.
Jennifer, give me a number.

S: 1,000,000,000.

T: 999,999,999.
Chris, give me a number.

S: 61.

T: 60.
I will apply my rule to one more number; then I'd like to see who has discovered the rule. Mark, give me a number.[*]

S: 250.

T: 249.
If you think you know my rule, raise your hand.

Accept several whispered answers and then ask someone to answer aloud; answers similar to the following ones are appropriate.

S: Take away one.

S: Subtract one.

S: You're saying the number that comes before the number we say.

Repeat this activity using several other rules, such as add 2, subtract 2, add 3, double, add 10, etc. Before asking students to guess a rule, be sure to give enough examples to establish a pattern.

This game may be played whenever you have a few spare minutes. The rules can be made more challenging as the school year goes on. You may want to let a student act as the computer once the game has been played several times, but be sure that the student tells you the rule being used (or that you tell the student which rule to use) so that you can check the responses of the "computer."

---

[*] When a student suggests 0, your response should be $\hat{1}$. However, if you feel your students do not know that $\hat{1}$ precedes 0, you may wish to say that this rule is only for numbers bigger than 0.

S16.2 -1, -2, -3 Arrow Picture

CAPSULE LESSON SUMMARY

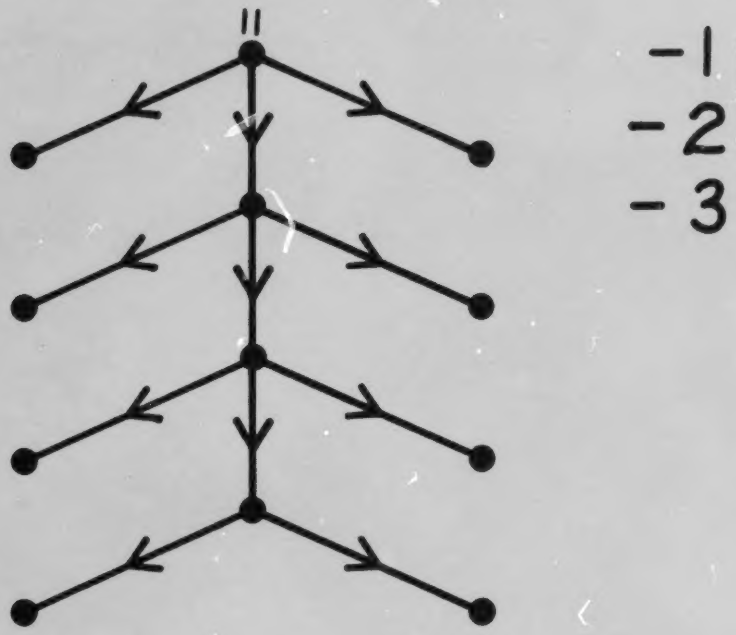
Label the dots in an arrow picture which has -1, -2, and -3 arrows. Draw missing -3 arrows.

MATERIALS

Teacher: Colored chalk
Student: Worksheets S16.2* and **

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



T: What are the blue arrows for?

S: -1.

T (starting at the top dot and tracing the blue arrow): 11 minus 1 is ...?

S 16

S: 10.

Write "10" next to the dot at the end of this blue arrow.

T: What are the red arrows for?

S: -2.

T (starting at the top dot and tracing the red arrow): 11 minus 2 is . . . ?

S: 9.

Label the dot at the end of this red arrow "9".

T: What are the green arrows for?

S: -3.

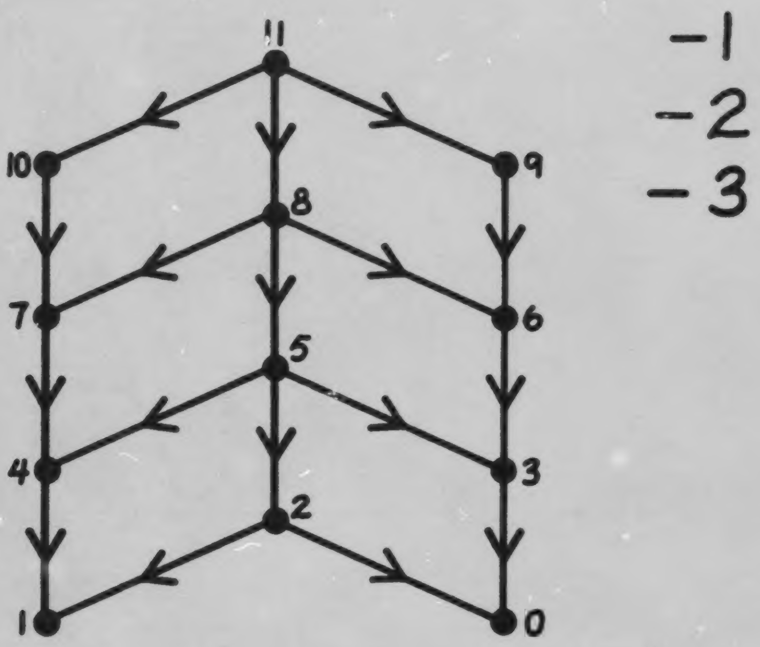
T (starting at the top dot and tracing the green arrow): 11 minus 3 is . . . ?

S: 8.

Label the dot at the end of this green arrow "8".

Call on students to label the other dots; each time, say the appropriate number story yourself. When all the dots are labeled, ask students to draw in any missing green arrows. Each time a green arrow is drawn, say the appropriate number story and ask if that story is a true one.

The completed picture (including the additional green arrows) is shown below.

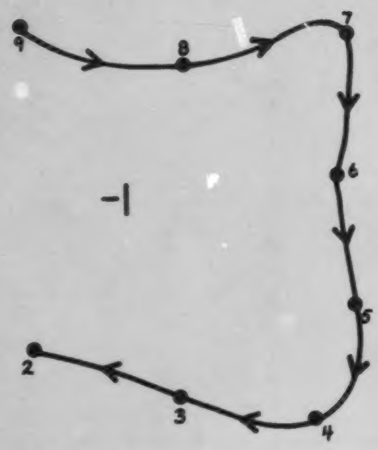


It is, of course, possible to include more -1 arrows (10 to 9, 9 to 8, 7 to 6, 6 to 5, 4 to 3, 3 to 2, and 1 to 0); and more -2 arrows (10 to 8, 9 to 7, 7 to 5, 6 to 4, 4 to 2, and 3 to 1). Do some of them if the class wants to continue, but do not insist that all possible -1 arrows and -2 arrows be drawn.

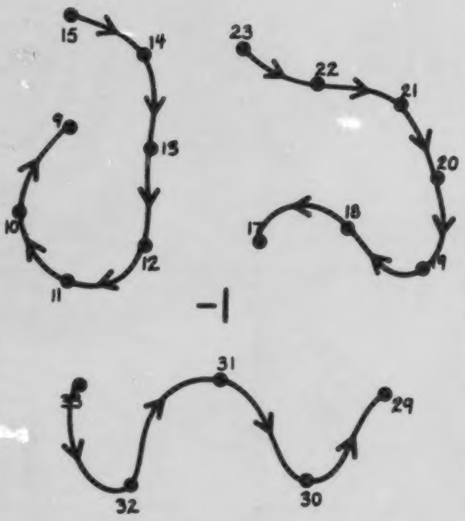
Distribute Worksheet S16.2* and ask the students to label the dots. Students who finish both sides of this worksheet should continue with Worksheet S16.2**.

Name____________________ S 16.2 *

Label the dots.

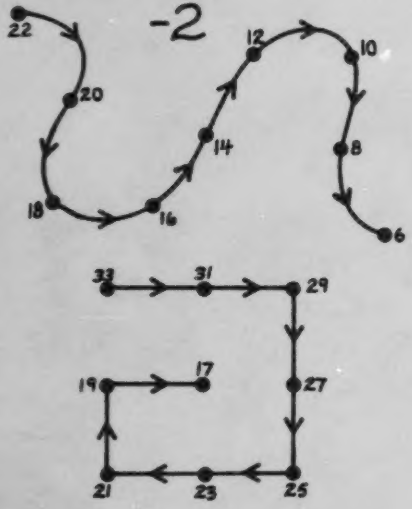


Label the dots.

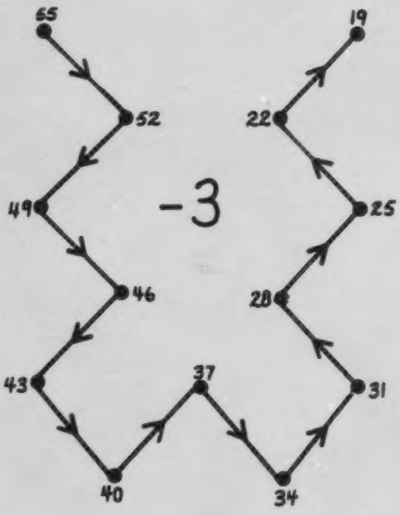


Name____________________ S 16.2 **

Label the dots.



Label the dots.



S17.1 Minicomputer Introduction #1

CAPSULE LESSON SUMMARY

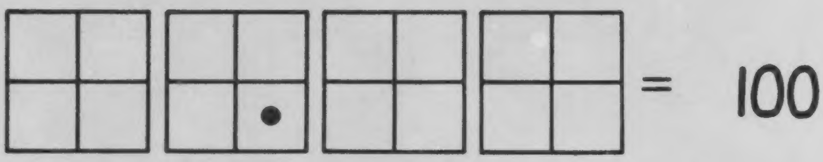
Put numbers larger than 999 on the Minicomputer using four boards. (Use the play "800 + 200 = 1,000" to introduce the fourth board.)

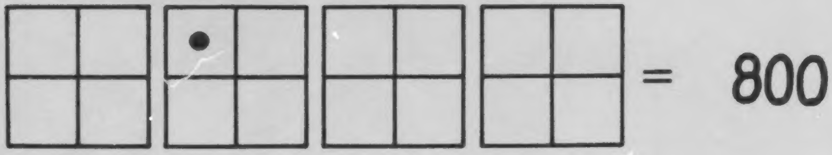
MATERIALS

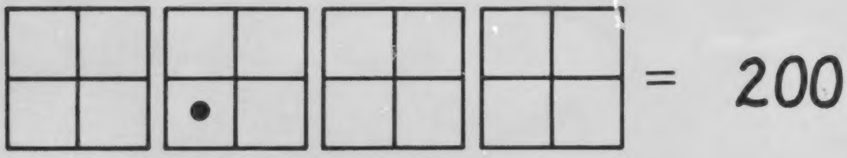
Teacher: Minicomputer set
Student: None

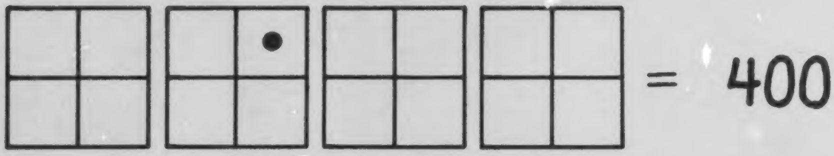
DESCRIPTION OF LESSON

Display four Minicomputer boards. Put the following numbers on the Minicomputer one at a time, and ask students to read them.



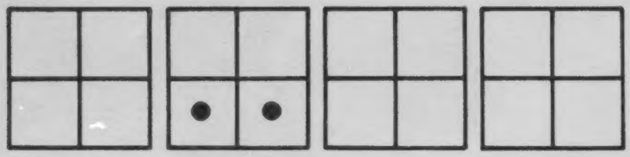






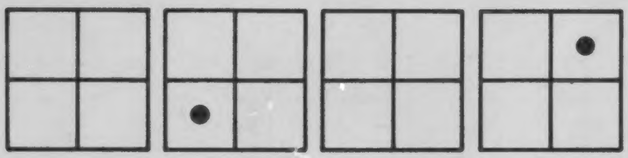
S 17

T: Who can put 300 on the Minicomputer?

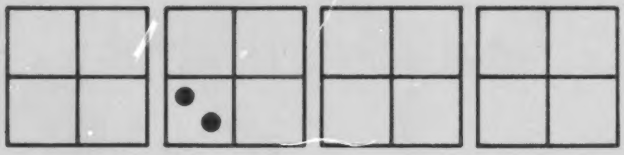


If a student suggests a non-standard configuration, accept it and ask who can put the number on with fewer checkers.

T: Who can put 204 on the Minicomputer?



Remove the checkers and put this new number on the Minicomputer.



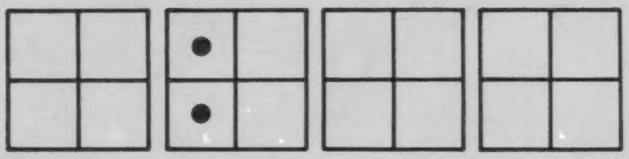
T: What number is this?

S: 400.

T: Who can put 400 on with just one checker?

S (making the play): 200 + 200 = 400.

Emphasize using both hands to make this play. Remove the checkers and put a new number on the Minicomputer.



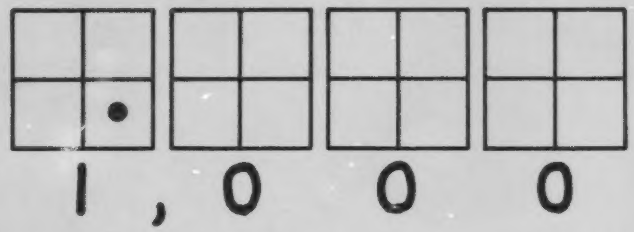
T: What number is this?

S: 800 + 200.

S: 1,000.

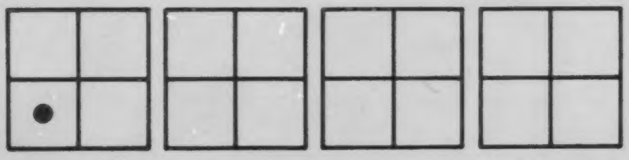
T: Who can put 1,000 on with just one checker?

The students may not yet have seen 1,000 on the Minicomputer, but can probably guess where it is and make the play. When they do (using both hands and saying "800 + 200 = 1,000"), write "1,000" under the Minicomputer.



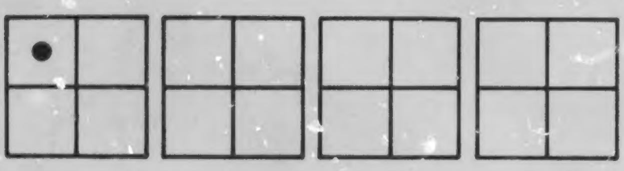
If students are unable to make the play, put a checker on the 1-square and ask the class which number this is. Repeat for the 10-square, the 100-square, and finally, for the 1,000-square.

T: Who can put 2,000 on the Minicomputer?

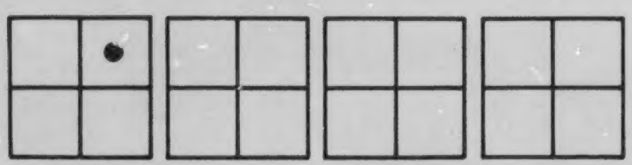


S 17

T: 8,000?



T: 4,000?



Continue this activity by asking the student to put these numbers on the Minicomputer.

3,000
6,000
5,000
7,000
9,000

If the lesson has gone well and the class remains interested, continue with these other numbers.

4,008
2,010
8,200
5,001
4,210
6,024
9,401
3,428

S17.2 Composition of Functions #1

CAPSULE LESSON SUMMARY

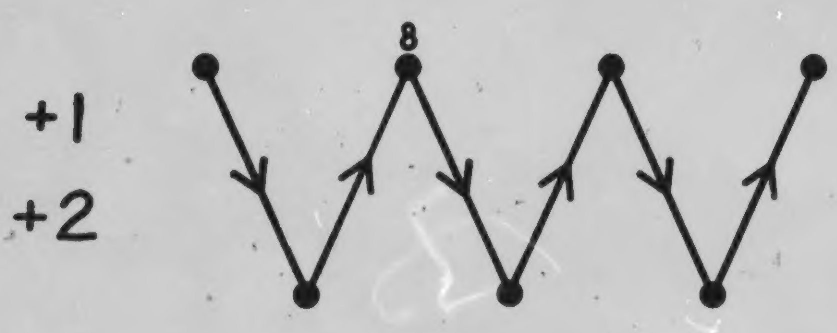
Label the dots in an arrow picture which has + 1 and + 2 arrows. Draw a new arrow in the picture and decide that it could be for + 3. Find where other + 3 arrows can be drawn.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



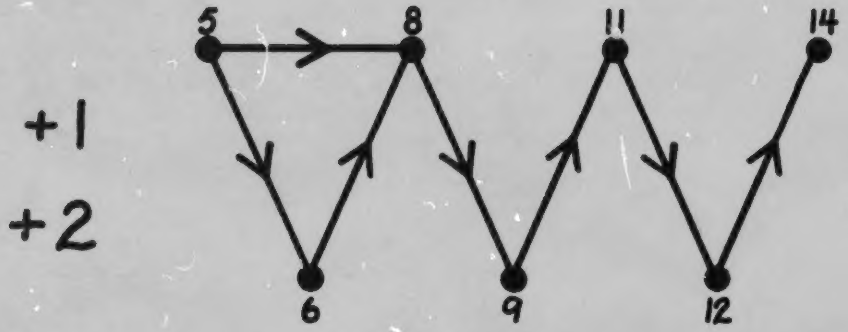
T: Who can label a dot for us?

Choose a volunteer to label a dot. If the student labels a dot immediately preceding or following the dot labeled " 8 ", check by saying the number story as you trace the appropriate arrow. For example,

T (tracing the red arrow starting at 8): 8 plus 1 is 9.

If the student labels a dot other than these two, suggest checking after some other dots have been labeled. Each time you read the number story for an arrow, use the number line or your fingers to verify the story. Continue until all the dots are labeled and then add this green arrow to your picture.

S 17



T: What could the green arrow be for?

There are many correct answers to this question, one of which is "I am less than you." If such an answer is given, tell the corresponding number story and, if correct, accept it but ask what else the arrow could be for. The most likely answer (and the one for which you are looking) is . . .

S: + 3.

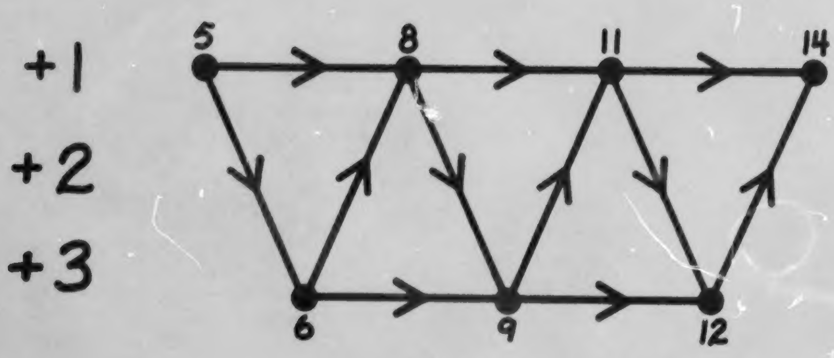
T: Good. 5 (point to the dot labeled "5") plus 3 (trace the green arrow) is 8 (point to the dot labeled " 8 ").

In green, write "+ 3" near the picture and continue.

T: Where else could we draw a green arrow?

Call on students to draw green arrows. Each time an arrow is drawn, tell the corresponding number story as you trace the arrow --- " 8 plus 3 is 11 ", for example --- and use the number line or your fingers to verify the number story. Continue until all possible green arrows have been drawn.

S 17



S 18

S18.1 Subtraction Problem #2

CAPSULE LESSON SUMMARY

Using the Minicomputer, decide how many pennies are left in each of three children's piggy banks after the children make a purchase.

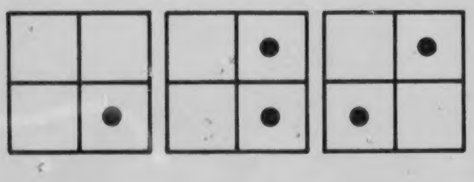
MATERIALS

Teacher : Minicomputer set
Student : None

DESCRIPTION OF LESSON

T: I have three little friends with piggy banks in which they save their pennies. When they have been very good, their parents let them take some of the pennies to buy something. One of the children, Jody, had 156 pennies in her bank. Who can put 156 on the Minicomputer?

Choose a volunteer to put 156 on the Minicomputer.



T: She decided to spend 42 of her pennies. How many did she have left?

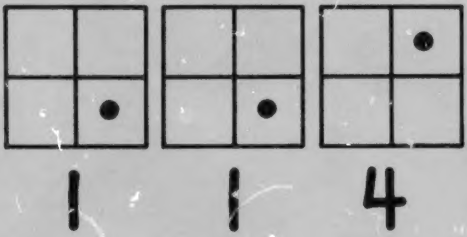
Accept several guesses and record them on the board.

T: What problem should I write?

S: "156 - 42 = ? ".

T: Who would like to take away 42 from the number on the Minicomputer?

Select someone to take away checkers for 42 and someone else to write the answer under the Minicomputer.



T: 114 pennies. Does anyone know another way to write "114¢"?

S: One dollar and 14 cents.

Ask the student to write this on the board.

$1.14

Encourage students who guessed correctly to explain how they found the answer, but do not be concerned if they are unable to explain. Remove all checkers from the Minicomputer.

T: Jody's brother Brad had 114 pennies but he likes to save his money, so he only spent 12 pennies. If we want to know how many he has left, what calculation would we write?

Ask a student to write this calculation on the board. However the student writes the calculation, put up both vertical and horizontal formats.

$$\begin{array}{r}114\\-12\\\hline\end{array}\qquad 114-12=$$

S 18

T: How many pennies are left?

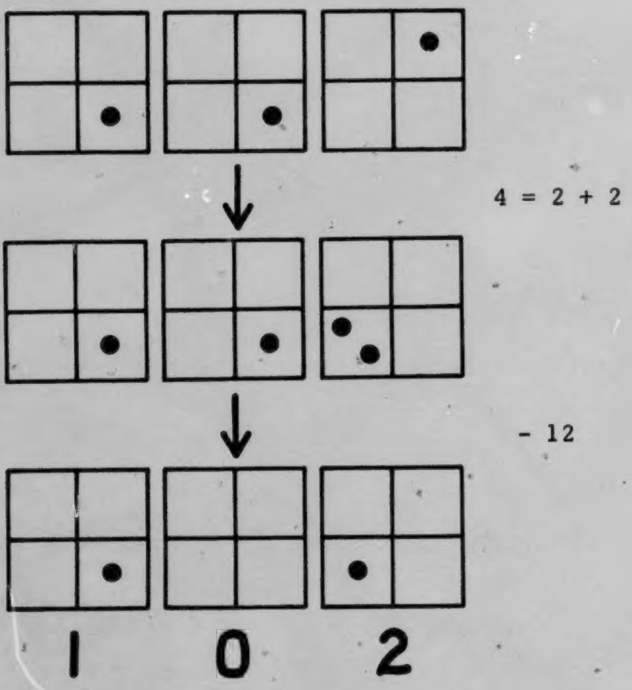
Accept several guesses and record them on the board. Then, choose a student to put 114 on the Minicomputer.

T: Who can take away 12?

S: I can take away 10, but there is no checker on the 2-square for me to take away.

S: We need a backward play.

Let a student make the "4 = 2 + 2" backward play and another take away 12. Write the answer under the boards.



Complete the calculation on the board.

$$\begin{array}{r}114\\-12\\\hline 102\end{array}$$

$$114 - 12 = 102$$

Encourage students who guessed correctly to explain how they found the answer. Do not be concerned, however, if students do not offer good explanations.

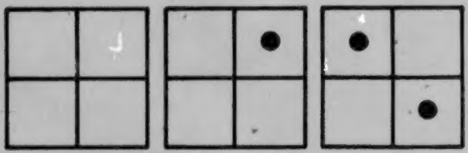
Invite a student to write the solution (102 pennies) in the way it is written in the stores: "$1.02".

T: Jody and Brad have a little sister named "Ruthie". Ruthie had only 49 pennies but she decided to spend 24 of them. What calculation can we do to find how many pennies she has left?

Ask a student to write this calculation on the board (again, use both formats).

$$\begin{array}{r} 49 \\ -24 \\ \hline \end{array} \qquad 49 - 24 =$$

Choose a volunteer to put 49 on the Minicomputer.

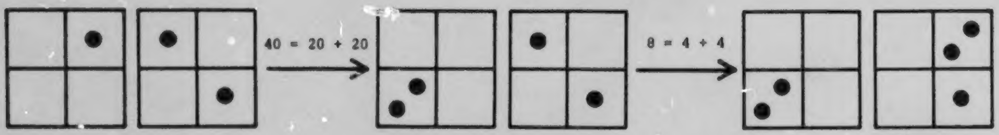


T: Who can take away 24?

S: We need to make a backward play first.

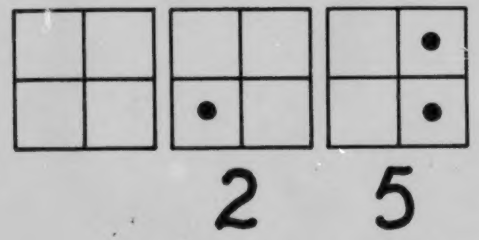
In this case, two backward plays are needed. The class should observe this after one is made. Invite students to make the plays (the order is not important).

S 18



T: Now, who can take away 24?

Call on a student to take away checkers for 24 and another student to write the answer under the Minicomputer boards.



Complete the calculation at the board.

$$\begin{array}{r}49\\-24\\\hline 25\end{array}\qquad 49 - 24 = 25$$

Encourage students who gave the correct answer to explain how they found the answer, but do not be concerned if no one offers an explanation.

S18.2 A Game with A-Blocks #2

CAPSULE LESSON SUMMARY

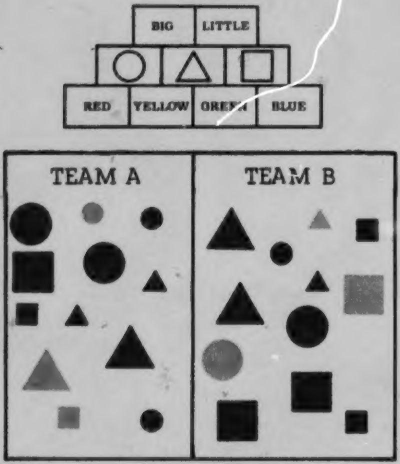
Play a String Game with A-Blocks. The first team to correctly place all of its game pieces in the string picture announces what the string is for.

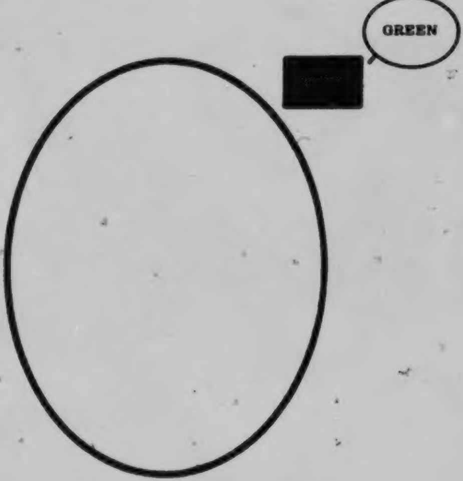
MATERIALS

Teacher: A-Block String Game kit[*]
Student: None

DESCRIPTION OF LESSON

Before the lesson begins, prepare the team board and divide the class into two teams. In colored chalk, draw a string on the board and place the card GREEN next to the string, face down.





T: Do you remember the game we played a few weeks ago? This card tells what the string is for; but for now, this is a secret. You must guess where each of the pieces go.

The white card could be any of these labels (point to the list of possible string labels above the team board). Let's read them together.

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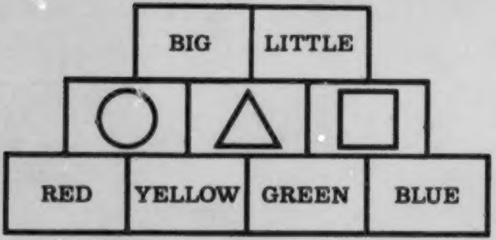
[*] See APPENDIX: The String Game for a description of equipment and preparation for the game.

S 18

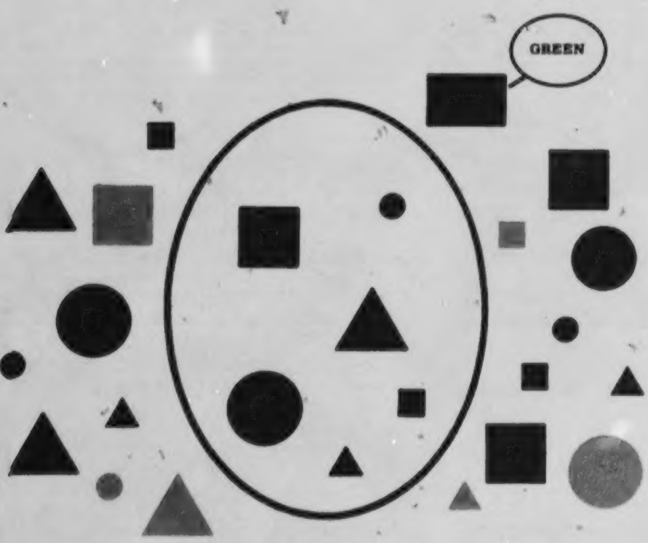


T: When one of the two teams has placed all of its pieces correctly, the last player can tell me what the string is for and can win.

No one should talk during the game; students who talk will cause their team to lose a turn. Before we begin, I will give you some clues.

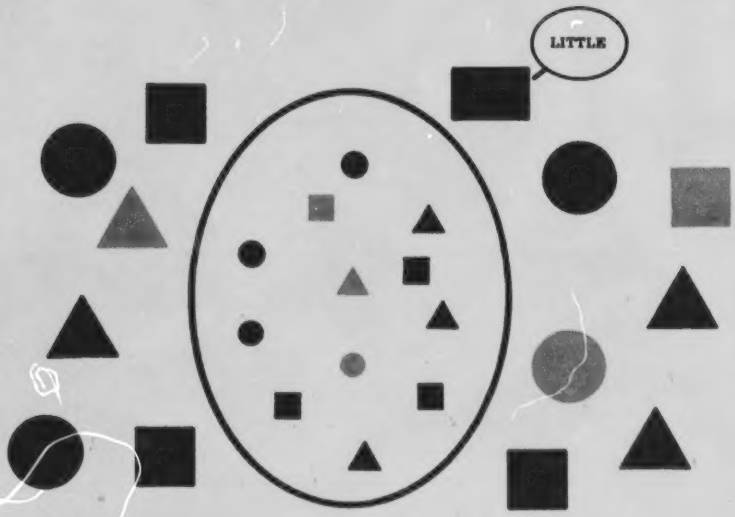
Place any green piece (inside the string) from among one team's pieces, and a piece of any other color (outside the string) from among the other team's pieces; then, proceed to play the game.

If a piece is correctly placed, say "yes" and allow the piece to remain in the picture; if the piece is placed incorrectly, say "no", and return it to the team board. To assist you in the judging, the correct placement of all pieces is shown below.



If your class enjoys this game and some time remains, play a second game using LITTLE for the string. From among the two teams' pieces, take a big piece and a little piece and place these two pieces appropriately.

The correct placement for all of the pieces is shown below.



S 19

S19.1 Piles of Checkers

CAPSULE LESSON SUMMARY

Start with 16 checkers. Put one half of them into one pile and the other half of them into another pile. Write number stories related to the situation.

MATERIALS

Teacher: None
Student: Individual Minicomputer checkers

DESCRIPTION OF LESSON

After distributing checkers to the class, ask each of the students to take out 16 checkers and place them on top of the desk. If some students do not have 16 checkers and others have more than 16, redistribute checkers so that every student has 16.

T: Put one half of the checkers into a pile and the other half into a second pile.

Do not provide any hints as to how this might be done. Observe the students' various methods and, when most of the students are finished, compliment anyone whose method demonstrates organization for example,

T: Mark had a good way of putting the checkers into piles. He put one checker on the right side of his desk and then one checker on the left side; next he put another checker on the right side and another on the left; and so on until he had put all of the checkers into two piles. Both piles have the same number of checkers.

How many checkers are there in each pile? (Eight)
Who can tell me a number story about these piles of checkers?

S: "8 + 8 = 16".

S: "$2 \times 8 = 16$".

S: "$\frac{1}{2} \times 16 = 8$".

If no one mentions this last number story, ask "What is one half of 16 checkers?" and then ask for the number story.

As the various number stories are suggested, either you or the students should write them on the board.

$$8 + 8 = 16$$

$$2 + 8 = 16$$

$$\frac{1}{2} \times 16 = 8$$

S19.2 Magic Squares #2

CAPSULE LESSON SUMMARY

Check whether or not a three by three array of numbers is a magic square.

MATERIALS

Teacher: Minicomputer set

Student: Minicomputer set[*]; Worksheets S19.2* and **

DESCRIPTION OF LESSON

T: Do you remember the magic squares we worked with some time ago? What was magic about them?

S: You always get the same answer . . . whether you add up and down, or across, or from corner to corner.

You may need to assist the students with an explanation. When the class understands the properties of a magic square, continue by drawing this square on the board.

5	12	13
10	14	6
15	4	11

Invite the class to discuss whether or not this is a magic square (it is not).

---

[*] A student's Minicomputer set consists of two individual Minicomputer sheets (two Minicomputer boards per sheet), plus one sheet of checkers.

Check the accuracy of whichever conclusion is offered by performing the addition problems for the square (use the Minicomputer).

$5 + 12 + 13 = 30$

$10 + 14 + 6 = 30$

$15 + 4 + 11 = 30$

$5 + 10 + 15 = 30$

$15 + 14 + 13 = 42$

$12 + 14 + 4 = 30$

$13 + 6 + 11 = 30$

$5 + 14 + 11 = 30$

Not all of these addition problems need be performed. Once it is discovered that one of the sums is 30 and another is 42, the class may properly conclude that the square is not magic. When you have performed one addition and have found the answer to be 30 (or 42), ask who can find a row, column or diagonal which does not add up to 30 (or 42). Check suggestions until the non-conforming row, column, or diagonal is found and conclude that the square is not a magic square.

Distribute Worksheet S19.2*. Explain to the students that the front page contains addition problems that the students may solve using their individual Minicomputers, if they like. A square is shown on the reverse side; students should determine whether or not it is a magic square. Students who finish S19.2*, should continue with S19.2**.

Name ____________________ S 19.2 *

Complete.

$$\begin{array}{r} 11 \\ +\ 6 \\ \hline 17 \end{array} \qquad \begin{array}{r} 21 \\ +\ 8 \\ \hline 29 \end{array}$$

14 + 21 = 35

23 + 12 = 35

6	1	8
7	5	3
2	9	4

Is this a magic square? Yes

Name ____________________ S 19.2 **

8	3	10
9	7	5
4	11	7

Is this a magic square? No

(One row, one column, and one diagonal have a sum of 22; the others have a sum of 21.)

21	16	23
22	20	18
17	24	19

Is this a magic square? Yes

S20 Adjustment Day #2

NOTE: See page 16, Section One NOTES TO THE TEACHER in CSMP Mathematics for the First Grade, Part I for a full explanation of the purpose of scheduled adjustment days.

On this day you may wish to repeat a previous lesson, either for a small group of students or for the entire class. Often the basic content of a particular lesson can be made to appear completely different by adjusting the story line and/or the numbers in the story. Consider the needs of your class in choosing lessons to repeat.

For students who need more experience in counting and/or ordering numbers, S16.1 Guess My Rule (using "add 1", "subtract 1", "add 2", etc.) and S19.1 Piles of Checkers are particularly helpful lessons. A variation of S17.1 Minicomputer Introduction #1 could be used with students who are having difficulty learning the language of the Minicomputer.

If you omitted the worksheets from any previous lesson, you may wish to distribute them today, after an appropriate warm-up activity. You could also use part of your mathematics time to play the A-Block game.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with S21.1 Multiplication Problem #2.

EARLY WARNING !

Among the next nine classroom lessons are some which require extra preparation time, or which include materials not included in the CSMP classroom set. These lessons are listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more than once during the nine-day period.)

S21.1 Multiplication Problem #2: egg carton
S27.2 Same First Initial: alphabetical class list

S21.1 Multiplication Problem #2

CAPSULE LESSON SUMMARY

Tell a story about a boy who accidentally breaks four dozen eggs. Using the Minicomputer, calculate "4 x 12" --- the number of extra minutes the boy must work, because he agrees to work one extra minute for each broken egg.

MATERIALS

Teacher: Egg carton; Minicomputer set
Student: None

DESCRIPTION OF LESSON

Hold up an egg carton (which will hold exactly one dozen eggs) in front of the class.

T: What comes in a carton like this?

Allow the students to express themselves freely. Encourage answers expressing the fact that there are 12 eggs in a dozen, and emphasize the word "dozen". Ask a student to check this fact by counting the number of places for eggs in the carton.

T: Now, I would like to tell you a story about a boy named Herman. Herman works in a grocery store. What might Herman do in his job at the grocery store?

Again, encourage an open discussion. Mention during this discussion that one of Herman's jobs is to keep the shelves stocked, and another job is to carry the customers' groceries out to their cars.

T: One day, Herman was busy stacking cartons of eggs in the dairy case at the store. But he was so busy that he wasn't very careful. Suddenly, he dropped a carton of eggs onto the floor -- Splat! -- and all of the eggs in the carton were broken. Herman cleaned up the mess as quickly as he could and then continued to fill the dairy case. He was very worried about what Mr. Vitale, the store manager, would say when he discovered Herman had broken a dozen eggs. Mr. Vitale had a very loud voice and frightened Herman!

Just then, Mr. Vitale was looking for Herman to carry out some groceries for Mr. Salas, who had bought so many groceries that he couldn't carry them all to his car. "Herman!" yelled Mr. Vitale. Of course, when Mr. Vitale shouted Herman's name, it frightened Herman and he dropped another carton of eggs -- Splat! Every one of them was broken. Herman didn't have time to clean up the mess; he rushed to the front of the store to see what Mr. Vitale wanted.

When Herman returned from carrying Mr. Salas' groceries, he was even more worried. He had broken two dozen eggs! "Two dozen eggs," thought Herman, holding a full carton in each hand, and staring at them sadly. He was about to put the two cartons on the shelf when suddenly, he slipped and fell! What do you think caused Herman to slip?

S: The broken eggs on the floor? When Mr. Vitale called him, Herman didn't have time to clean them up.

T: That's right. So Herman slipped and fell, and dropped both of the cartons he was holding -- Splat! Splat! He broke them all! Poor Herman . . . how many dozen eggs in all has he broken?

S: Four dozen.

Take a moment to discuss this if some of the students have lost count.

T: Herman cleaned up the mess and went straight to Mr. Vitale to tell him what had happened. Herman told Mr. Vitale that he was very sorry about the accidents and would work an extra minute for every egg that he had broken. Mr. Vitale was pleased that Herman was honest about the mistake and agreed to let Herman work one extra minute for each broken egg. How many extra minutes must Herman work that day, to make up for the broken eggs?

Ask several students to guess the answer and record their guesses on the chalkboard.

T: How can we find the number of extra minutes Herman must work?

A student might suggest calculating "4 × 12" on the Minicomputer. If necessary, suggest this yourself. When the calculation is finished, congratulate the student(s) with the closest guess. Ask any students with the correct answer to explain how they obtained it.

T: Who can write a number story for this problem?

If a student suggests "12 + 12 + 12 + 12 = 48", accept this answer but ask if someone could write a shorter number story: "4 × 12 = 48". Conclude with the class that Herman must work 48 extra minutes to make up for the broken eggs.

S21.2 The Function - 3

CAPSULE LESSON SUMMARY

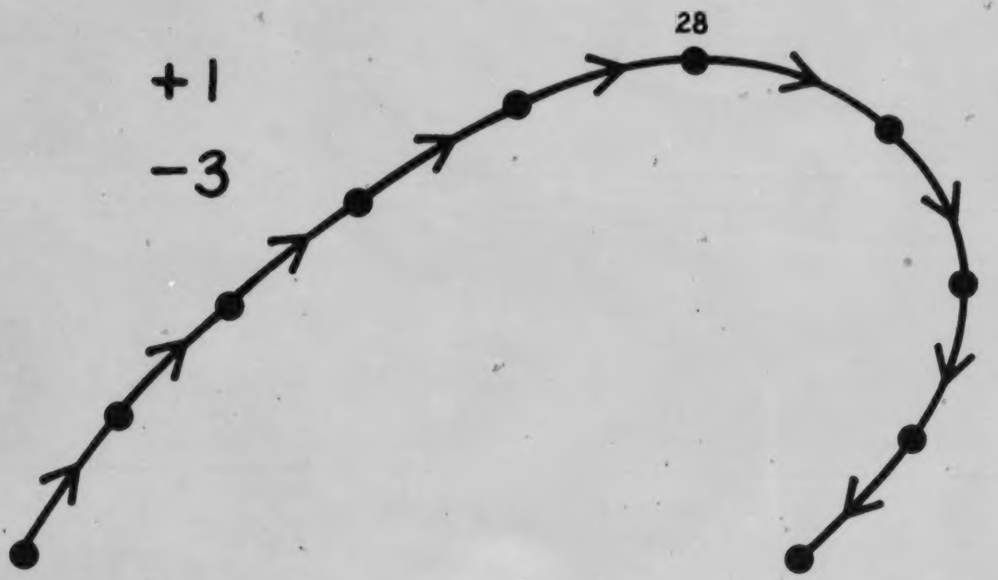
Label the dots in a +1 arrow picture, and then draw all possible - 3 arrows. Check each - 3 arrow by counting backward three from the starting number of the arrow. Draw a new arrow from the last dot in the picture ("32") to the first dot ("23") and decide that this arrow is for - 9.

MATERIALS

Teacher: Colored chalk
Student: Worksheets S21.2* and **; colored pencils

DESCRIPTION OF LESSON

Using red and blue chalk, draw this arrow picture on the board.



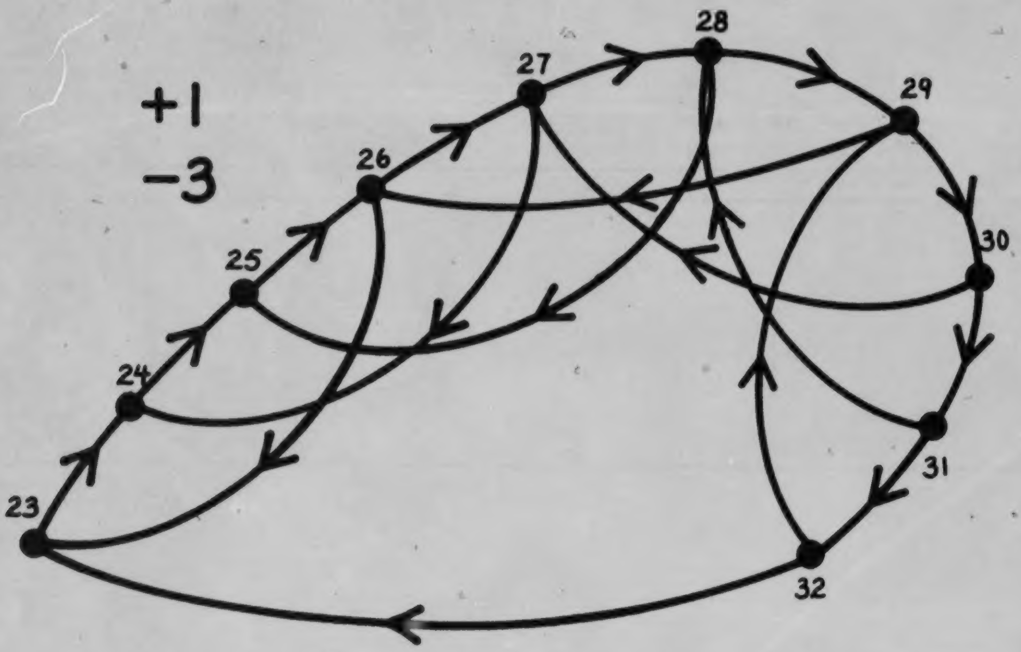
Ask volunteers to label the dots. Each time a dot is labeled, either you or one of the students should read the appropriate number story to the class. For example, when the dot for 29 is labeled, the appropriate number story would be "28 + 1 = 29". Continue this activity until all the dots are labeled.

T: Where could we draw a blue - 3 arrow?

Ask a student to trace the arrow at the board. If the arrow is a correct one, draw it yourself. The following dialogue assumes that a - 3 arrow has been drawn from 32 to 29. Point to "32".

T: 32 take away 1 (point to "31").
32 take away 2 (point to "30").
32 take away 3 (point to "29").
32 take away 3 equals 29.
Who can draw another - 3 arrow?

Continue until all of the - 3 arrows are drawn (see the illustration below). Using a third color of chalk, draw an arrow from 32 to 23.



T: What could this new arrow be for?

Compliment any students who suggest - 9 and then point to "32".

T: 32 take away 1 (point to "31").

. . . take away 2 (point to "30").

. . . take away 3 (point to "29").

.

.

.

. . . take away 9 (point to "23").

32 take away 9 equals 23. What is this new arrow for?

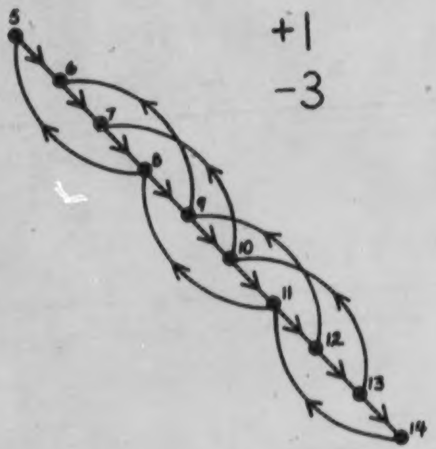
Write " -9 " near the arrow picture.

Worksheets S21.2* and ** are available for the remainder of the period. Explain to the students that they are to label the dots and draw all of the missing arrows. Do not expect all of your students to complete the one-star worksheet correctly.

S 21.2 *

Name ____________________

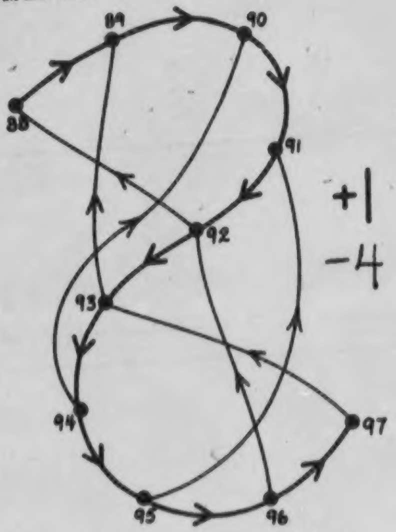
Label the dots. Draw all the missing −3 arrows.



S 21.2 **

Name ____________________

Label the dots. Draw all the missing −4 arrows.



S 22

S22 "I Am a Very Happy Boy"

CAPSULE LESSON SUMMARY

Read the story "I Am a Very Happy Boy" and discuss the various string pictures and arrow pictures in this story.

MATERIALS

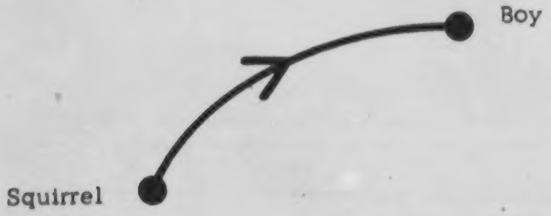
Teacher: "I Am a Very Happy Boy" storybook
Student : "I Am a Very Happy Boy" storybook
(one copy for each pair of students)

DESCRIPTION OF LESSON

Although "I Am a Very Happy Boy" uses the mathematical languages of dots, arrows, and strings, it is really a story, in the true sense of the word. Read this storybook to your class as you would read any story. Let the students discuss the pictures, but avoid overemphasizing the mathematical aspects of the story.

Give each pair of students one copy of "I Am a Very Happy Boy". Ask the students to follow the story as you read it to them. As you are reading, be sure the students have an opportunity to look at the pictures in the storybook. For any appropriate illustration, ask the students where the boy is and who the other dots could be for. The following information is provided for your convenience and use during the lesson.

page 12:
The blue arrow is for "I am following you".



page 13:

The green arrow is for "I am talking to you". The squirrel is alone on the left.

page 14:

The blue arrow is for "I am following you".

page 15:

The dog is alone on the left. The two farmers are in the red string.

pages 28 and 29:

The blue arrow is for "I am following you".

There is a narration tape* available for the story "I Am a Very Happy Boy". On some other occasion, you could listen to it as a class, or you could let the students listen to it individually at any time during the year. In any case, make at least one copy of this storybook (with or without the accompanying tape) available to students who wish to look at it in their spare time.

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* This tape may be obtained by sending a blank, 30-minute cassette tape to CEMREL-CSMP. The recorded tape will be returned to you free of charge. Please be sure to mention the title of this story in your request for the tape to be recorded, and include a stamped, self-addressed envelope.

S23 Introduction to Even and Odd Numbers #1

CAPSULE LESSON SUMMARY

Begin with mental arithmetic activities on doubling. Use the Minicomputer and a string picture simultaneously to explore even and odd numbers. Extend this activity to include larger numbers and numbers in a specified range.

MATERIALS

Teacher: Minicomputer set
Student : None

DESCRIPTION OF LESSON

Exercise 1

Begin this lesson with five to ten minutes of mental arithmetic activities similar to those described below. The pace of these activities should be brisk, and you should try to involve all of your students by varying the difficulty of your questions. If a student cannot answer, or answers incorrectly, simply ask a second student to respond. For your reference, a sample dialogue is provided here.

T:	What number is 5 + 5?	S:	10.
	5 + 5 = 10. What number is 2 × 5?	S:	10.
	2 × 5 = 10. What number is 3 + 3?	S:	6.
	3 + 3 = 6. What number is 2 × 3?	S:	6.
	2 × 3 = 6. What number is 2 × 1?	S:	2.
	2 × 1 = 2. What number is 2 × 10?	S:	20.
	10 + 10 = 20, so 2 × 10 = 20.		
	What number is 2 × 100?	S:	200.
	2 × 100 = 200. What number is 2 × 1,000?	S:	2,000.
	1,000 + 1,000 = 2,000, so 2 × 1,000 = 2,000.		
	What number is 2 × 1,000,000?	S:	2,000,000.

Can anyone write "2,000,000" on the board for us?

Compliment any student who writes "2,000,000" correctly. Be prepared to add or move commas as necessary.

T:	What number is 2 × 2?	S:	4.
	2 × 2 = 4. What number is 2 × 3?	S:	6.
	2 × 3 = 6. What number is 2 × 4?	S:	8.
	2 × 4 = 8. What number is 2 × 6?	S:	12.
	6 + 6 = 12 so 2 × 6 = 12. What is 2 × 7?	S:	14.
	2 × 7 = 14. What number is 2 × 8?	S:	16.
	2 × 8 = 16. How do you know that?		

Accept any reasonable explanation.

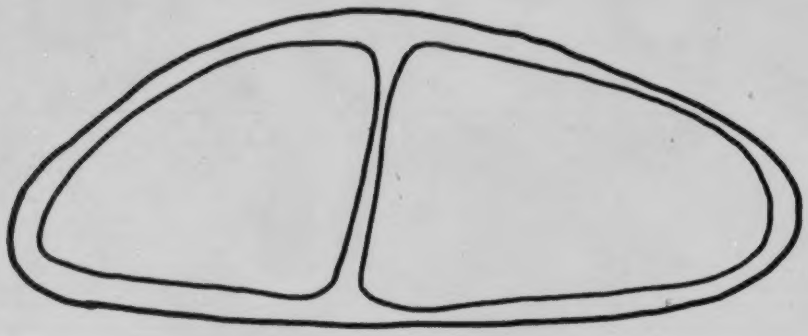
T:	Does anyone know what number 2 × 9 is?	S:	18.
	Right; 2 × 9 = 18, because 9 + 9 = 18.		
	What number is 2 × 10?	S:	20.
	2 × 10 = 20. What number is 2 × 20?	S:	40.
	How do you know?		

Perhaps one of the students will explain that one of the plays on the Minicomputer is: "20 + 20 = 40".

T:	2 × 200 = . . . ?	S:	400.
	2 × 2,000 = . . . ?	S:	4,000.
	2 × 2,000,000 = . . . ?	S:	4,000,000.
	2 × 2,000,000,000 = . . . ?	S:	4,000,000,000.

Exercise 2

Display three Minicomputer boards and, on the chalkboard, draw a large string picture similar to the one shown below. Draw the green string first and then fit the red and blue strings snugly inside it. You will be drawing dots for the whole numbers (i.e., 0, 1, 2, 3, . . .), with the odd numbers in the red string and the even numbers in the blue string. Of course, there are no whole numbers which are neither odd nor even.



T: The green string is for whole numbers, and we are going to put some whole numbers on the Minicomputer.

NOTE: It is appropriate to begin using the term "whole number," so that the students will become familiar with it; however, do not expect your students to use the phrase. Should one of your students ask for an explanation of "whole numbers", reply simply that you are referring to the numbers 0, 1, 2, 3, etc.

T: I have a secret rule for deciding which numbers go in the blue string and which go in the red string. I will give you a hint: when we put the numbers on the Minicomputer, watch the 1-square carefully.

Point to the 1-square of the Minicomputer.

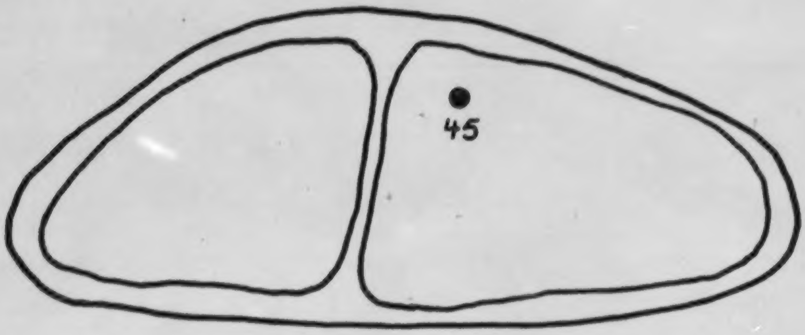
T: There is something special about this white square. You may choose the numbers we will use today, but only choose numbers between 0 and 100. Who would like to choose the first number?

Accept any whole number between 0 and 100. If students suggest negative numbers or fractions, say simply that these are not whole numbers, and that the students must choose one of the numbers 0, 1, 2, 3, and so on, up to 100.

Suppose a student suggests the number 45. Ask the student to put 45 on the Minicomputer. If necessary, let the class make plays until the standard configuration is given.

T: Are you paying attention to the 1-square? Good; 45 is in the red string.

In the red string, draw and label a dot for 45.



Continue to accept various numbers from students until at least four dots have been drawn. Be sure that at least one dot has been drawn in each of the two strings; if necessary, choose a number yourself.

T: Who would like to choose the next number?

Invite a student to put this number on the Minicomputer.

T: Does this number go in the red string or in the blue string?

Respond appropriately "yes" or "no" and then draw a dot in the correct string for the number.

Continue this activity --- accepting numbers, inviting students to put them on the Minicomputer (in standard configuration), asking which string the numbers go in, and putting the numbers into the string picture --- until many of the students have discovered your secret rule. Occasionally, you may wish to remind the students to observe the 1-square carefully.

T: I think some of you know my secret rule now. Who would like to explain my rule?

Perhaps a student will observe that numbers with a checker on the 1-square go in the red string; and numbers without a checker on the 1-square go in the blue string. Some of your students may already know about odd and even numbers and may tell you that all of the even numbers are in the blue string, and all of the odd numbers are in the red string.

If no one has discovered your rule yet, choose several consecutive numbers such as 78, 79, 80, and 81. Remind the students to observe the 1-square. Give the students another opportunity to tell you your secret rule. If the students continue to have difficulty describing the rule, you may have to explain it yourself. In either case, express your rule as follows.

T: The numbers in the red string are called "odd numbers". An odd number always has a checker on the 1-square.

Label the red string "odd numbers".

T: The numbers in the blue string are called "even numbers". An even number can be put on the Minicomputer without any checkers on the 1-square.

Label the blue string "even numbers".

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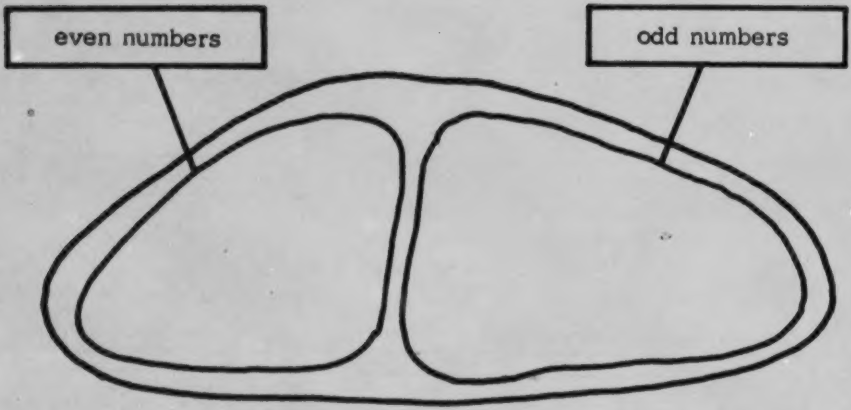
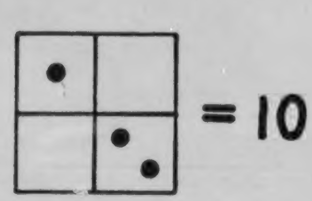


NOTE: An even number can be put on the Minicomputer with checkers on the 1-square, but not in standard configuration; for example:



However, since 10 is even, it can also be shown without checkers on the 1-square (while odd numbers cannot). If this point is not raised by the class, make no mention of it. If the question is asked --- during this or some future lesson --- consider it briefly, ask the class to make plays on the Minicomputer, and conclude that an even number can be put on the Minicomputer without any checkers on the 1-square.

Display a fourth Minicomputer board.

T: Let's play this game using some larger numbers. What number would you like to choose first?

Accept any whole number between 0 and 10,000 and ask a student to put this number on the Minicomputer (in standard configuration). You may wish to ask someone else to write this number below the Minicomputer boards. Then, choose a volunteer to put the number into the string picture. Continue, in a similar manner, until four or five additional numbers have been put into their appropriate string(s).

Remove all checkers from the Minicomputer.

T: Now I am going to choose some numbers. Tell me whether the number I choose is even or odd. Try to imagine the number on the Minicomputer.

Choose at least four numbers (for instance: 100, 43, 216, and 2,481). If someone answers incorrectly, ask the student to put the number on the Minicomputer.

If your class remains interested, continue with Exercise 3.

Exercise 3

T: Who knows an odd number which is less than 10?
Who knows an even number which is more than 50?
An even number which is less than 1,000?
An odd number which is more than 300?

Continue this activity for as long as you feel is appropriate. You may want to end this lesson by asking for an even number which is more than 1,000,000.

S24.1 Addition Problem #3

CAPSULE LESSON SUMMARY

In a game situation, use the Minicomputer to add the odd numbers between 0 and 20. Perform the calculation without the help of the Minicomputer by pairing the numbers (so that each pair adds to 20: 1 + 19; 3 + 17; etc.) and then adding 20 five times.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

T: Let's pretend that I have a great big, empty bag and that some of you are going to put some pennies in it.

This activity requires the participation of ten students. After choosing these students, point to them in a sequence which is easy for you to remember. A sample dialogue is given here.

T: Jerry puts one penny in the bag;
Tammy puts in three pennies;
Susan puts in five pennies;
Bryant puts in seven pennies;
Janie puts in nine pennies;
Todd puts in eleven pennies;
Carlos puts in thirteen pennies;
Bobby puts in fifteen pennies;
Cara puts in seventeen pennies;
Linette puts in nineteen pennies.
How many pennies will there be in my bag?

Allow the students to make some guesses and record these guesses on the board.

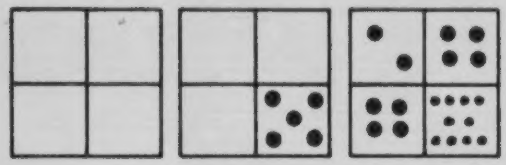
S 24

T: How can we find out exactly how many pennies will be in my bag?

Perhaps someone will suggest using the Minicomputer; if not, suggest this yourself. Display three Minicomputer boards.

T: Remember the number of pennies you put in the bag. When I call your name, come and put that number on the Minicomputer.

Following the sequence you used earlier, ask each of the ten students to come and add his or her number to the Minicomputer. This will result in a large number of checkers on the ones' board, so you should watch carefully to be sure each student puts on the correct number. To avoid confusion, you may wish to push the checkers to one side of each square after a number has been added on. When all ten students have put their numbers on the Minicomputer, this configuration will be on it:



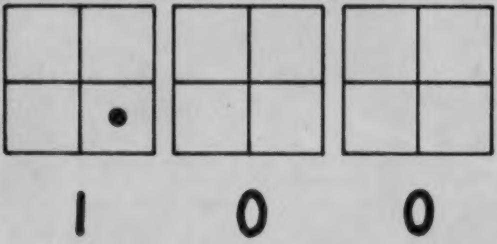
T: What problem can we write?

$$1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 =$$

T: What do you notice about this problem?

S: All of the numbers are odd; everyone put an odd number of pennies in the bag.

Ask several students to make plays on the Minicomputer, directing students to make "8 + 2 = 10" plays whenever possible (otherwise backward plays may later become necessary). When the standard configuration is obtained, let a student write the numeral below the Minicomputer.



Complete the number story on the board and determine which guess was closest.

$$1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 = 100$$

T: How much money is 100 pennies? (One dollar)
Who can write "$1.00" on the board?

If necessary, help the volunteer write "$1.00".

If your class remains interested, continue by pointing to the number story on the board.

T: Do you see an easy way to add these numbers without using the Minicomputer?

Allow the students to offer suggestions freely, but compliment any student who suggests pairing 1 with 19, 3 with 17, 5 with 15, etc., to get five groups of 20. If no one makes this suggestion, point to "1" and "19" and ask what number is 1 + 19. You may wish to repeat this question with "3 + 17". If this method still remains beyond the students' grasp, however, leave the matter unresolved and continue with Lesson S24.2.

S 24

S24.2 The Number Line Game

CAPSULE LESSON SUMMARY

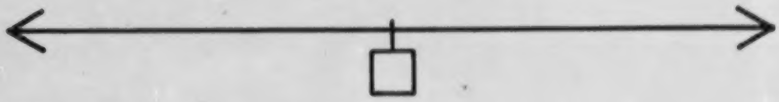
Introduce the Number Line Game in which students discover a secret number from its location on the number line, relative to those of numbers given in a succession of guesses.

MATERIALS

Teacher: None
Student: None

DESCRIPTION OF LESSON

Draw a number line on the board. Choose a point near the center of the line and label it with an empty box.



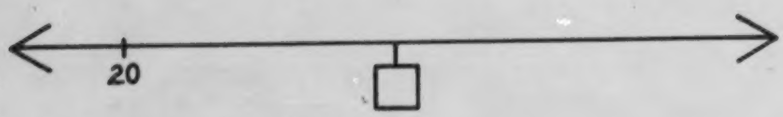
T: Let's play a game with the number line. I am thinking of a number between 0 and 50.

On this number line, my secret number goes right here (point to the box), but it is hidden behind this little box. You must guess my secret number.

Ask one of the students to make a guess. If the number suggested is not between 0 and 50, remind the class that your number is between 0 and 50, and then ask for another guess. The following sample dialogue assumes that your secret number is 37.

S: Is your number 20?

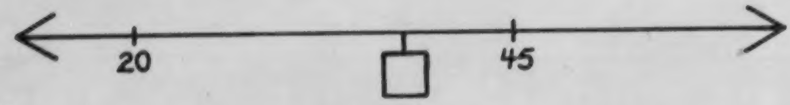
T: No, 20 is less than my number. I'll show you where 20 is on the number line. This might not be exactly the right place, but I'll try to be as accurate as I can.



T: 20 is less than my number. Another guess?

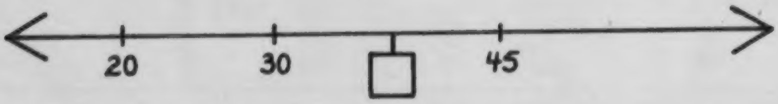
S: 45.

T: 45 is more than my number.



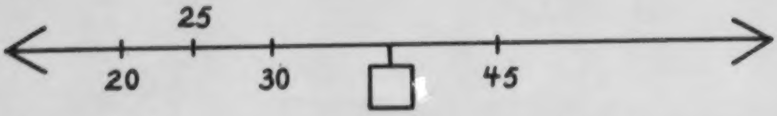
S: 30.

T: 30 is less than my number.



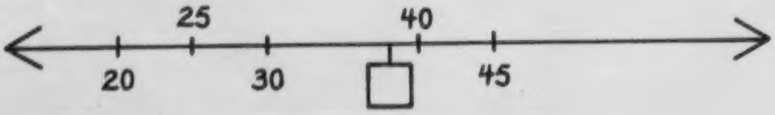
S: 25.

T: 25 is less than my number.



S: 40.

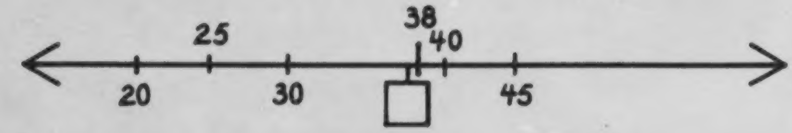
T: 40 is more than my number.



S: 38.

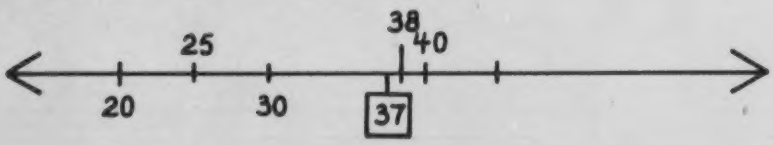
S 24

T: 38 is more than my number.



S: 37.

T: Correct! 37 is my secret number.



Play the game a few more times, choosing other secret numbers which are between 0 and 50. You may wish to let the student who correctly guessed your secret number choose the next secret number, whispering it to you.

S25.1 Fair Distribution #3

CAPSULE LESSON SUMMARY

Share 18 sunflower seeds between two squirrels using a string picture to describe the situation. Write number stories about the situation and relate them in an arrow picture, using the relations $2\times$ and $\frac{1}{2}\times$.

MATERIALS

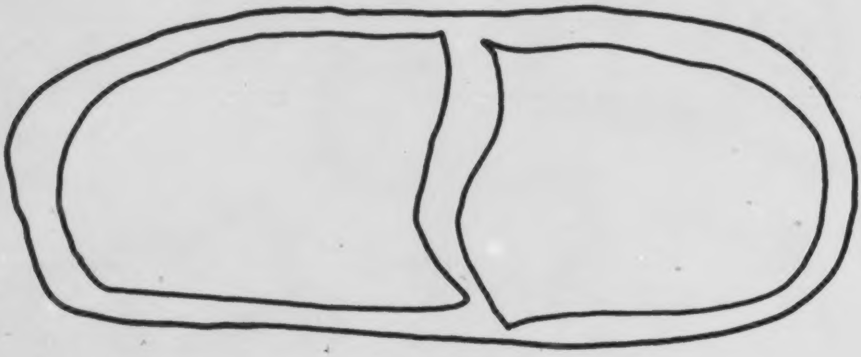
Teacher: Colored chalk
Student: Unlined paper; colored pencils

DESCRIPTION OF LESSON

After distributing paper and pencils to the students, tell the following story or one similar to it.

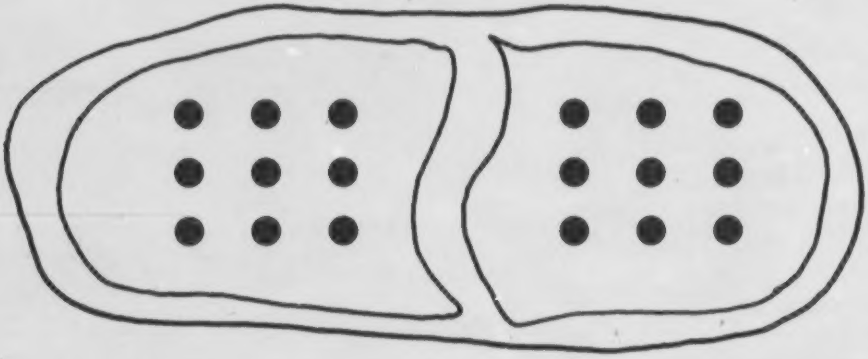
T: Every morning, two squirrels come up to my doorstep for their breakfast. I have 18 sunflower seeds which I would like to give to the squirrels tomorrow morning, but I want to be fair and give both of them the same number of seeds. I'll make a pile of sunflower seeds for each squirrel, but I need to know how many seeds I should put in each pile.

Using three colors of chalk, draw this string picture on the board.



T: Let's put the sunflower seeds for one squirrel in the blue string and the seeds for the other squirrel in the red string. Draw this string picture on your papers, and then draw dots inside the strings for the 18 seeds.

Allow the students to work for a few minutes. Students who need help should be encouraged to share the 18 seeds by drawing them, one by one, in alternating strings. You may wish to say, "One for this squirrel, one for that squirrel", etc. When several students have finished, ask one of them to draw the dots in the string picture on the board.

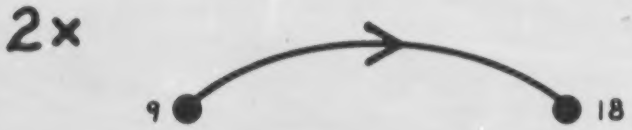


T: What number stories can we write about this string picture?

Accept all appropriate number stories. Students might suggest "2 × 9 = 18" and "$\frac{1}{2}$ × 18 = 9"; if not, suggest them yourself.

T: 2 × 9 = 18. How could we tell this number story with an arrow picture?

Ask a student to draw such an arrow picture on the board.



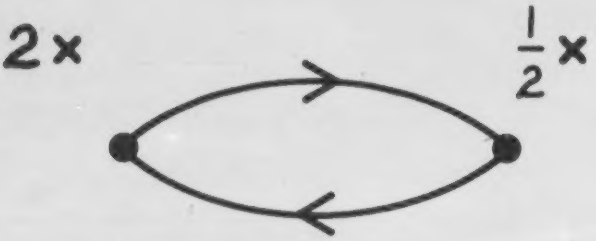
If the students find this too difficult, draw and label the dots for 9 and 18 yourself and then ask a volunteer to draw the 2 × arrow. Write "2 × " near the arrow picture.

T: Who can read this arrow picture for us?

S: $2 \times 9 = 18$.

T: We have another number story: "$\frac{1}{2} \times 18 = 9$" (read: one-half of eighteen equals nine). Who could draw a blue arrow.

Be prepared to help. This may be the first time your students have seen a $\frac{1}{2}\times$ arrow.



Trace the arrows with your finger as you read the two number stories.

T: $2 \times 9 = 18$ and $\frac{1}{2} \times 18 = 9$.

NOTE: It is possible, of course, to draw arrow pictures for other number stories the students might suggest (such as "$9 + 9 = 18$"). To help focus the students' attention on these two relations, however, it is suggested that today you draw only 2 × and $\frac{1}{2}$ × arrows.

S25.2 Introduction to "A Parade of Problems #2"

CAPSULE LESSON SUMMARY

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures and so on.

MATERIALS

Teacher: None

Student: "A Parade of Problems #2" workbook; colored pencils

DESCRIPTION OF LESSON

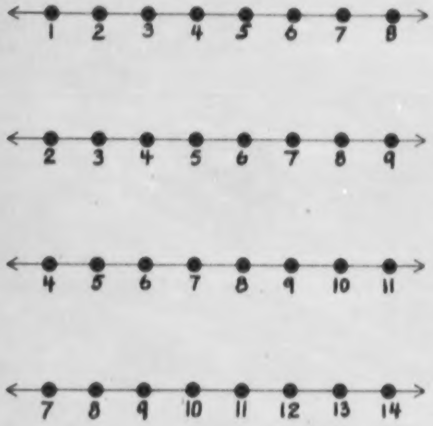
Distribute copies of "A Parade of Problems #2" and allow students to work at their own rates. Circulate among the class to give individual help where it is needed. Encourage the students to work carefully and to check their work.

Allow about twenty minutes for this independent work. Because pages of the workbook increase in difficulty as the students progress through them, some students will naturally complete more pages than will others. We have deliberately provided enough exercises so that even your brightest students will remain challenged.

A second lesson is scheduled for the use of this workbook. When the period is over, collect the workbooks. Check them and have them ready for use again in Lesson S35.2. (See the discussion on workbooks in Section One, NOTES TO THE TEACHER, page 10 of Part I Mathematics for the First Grade.)

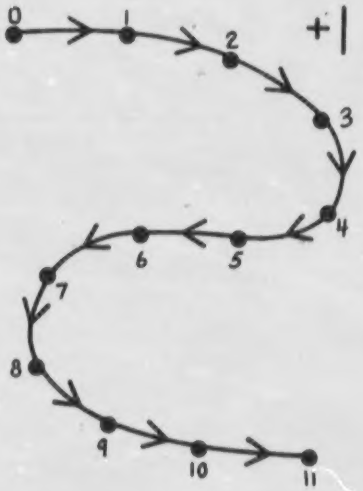
A Parade of Problems 2

Label the dots on these number lines.



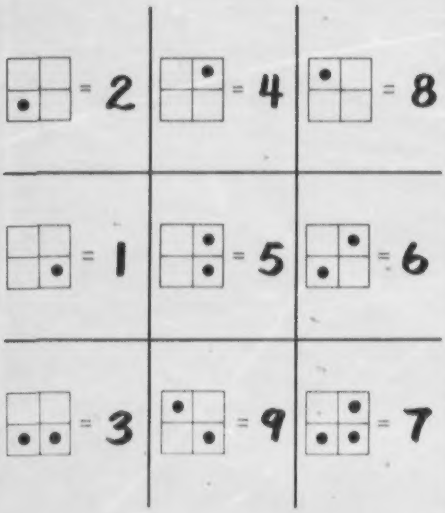
2

Label the dots.



3

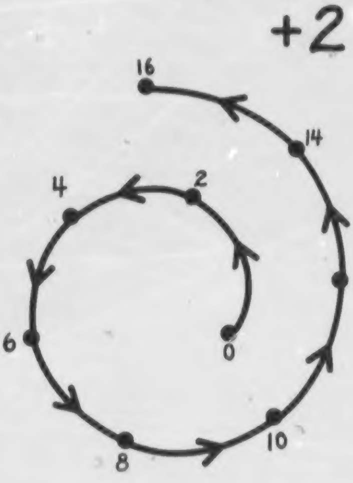
Put the number on the Minicomputer.



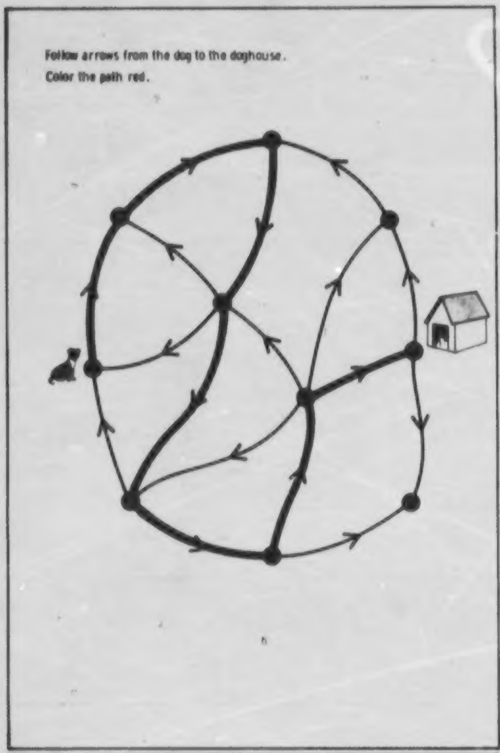
4

Standard configurations are used here; however, other solutions are possible.

Label the dots.

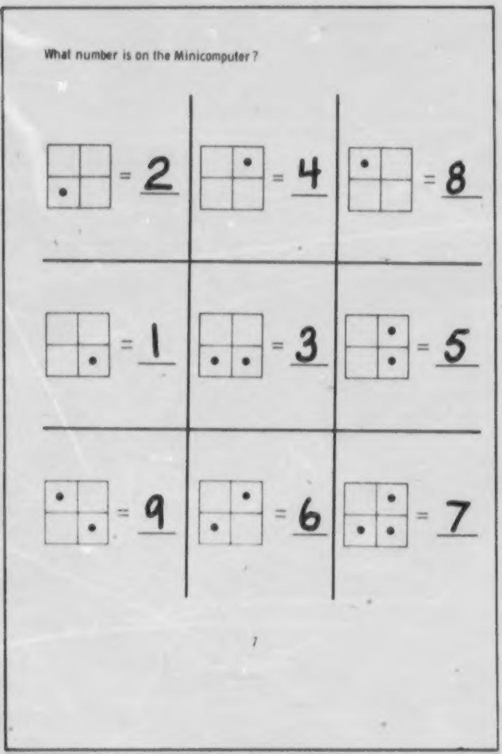


5



Follow arrows from the dog to the doghouse.
Color the path red.

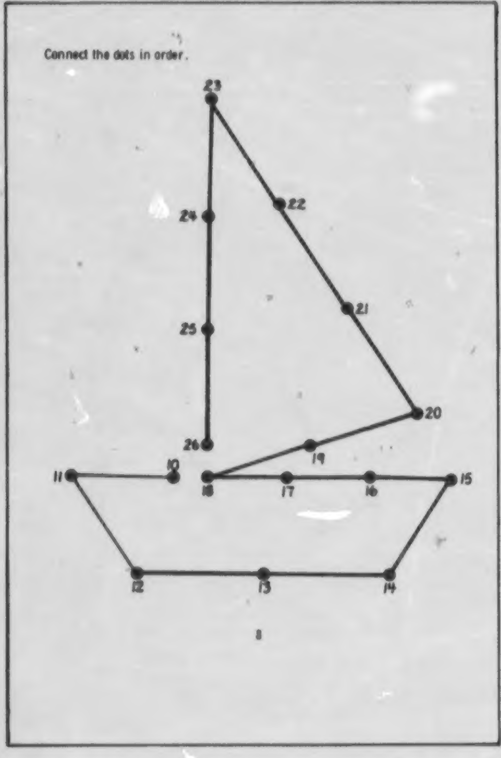
6



What number is on the Minicomputer?

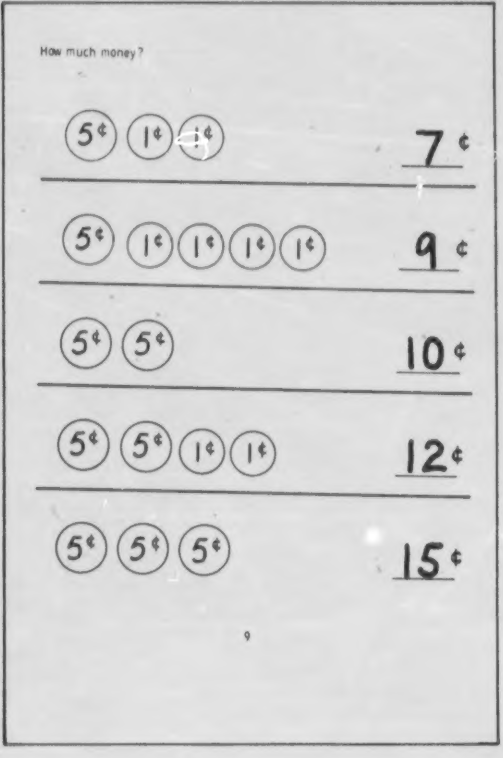
= 2
= 4
= 8
= 1
= 3
= 5
= 9
= 6
= 7

7



Connect the dots in order.

8

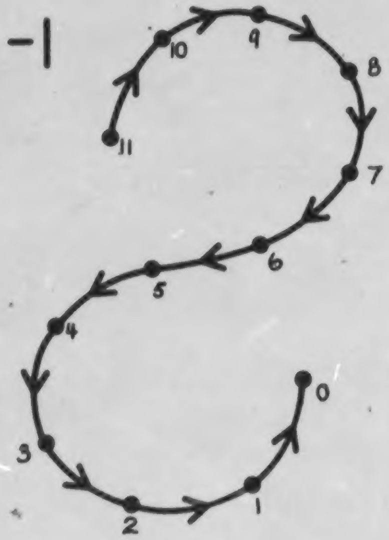


How much money?

5¢ 1¢ 1¢ — 7¢
5¢ 1¢ 1¢ 1¢ 1¢ — 9¢
5¢ 5¢ — 10¢
5¢ 5¢ 1¢ 1¢ — 12¢
5¢ 5¢ 5¢ — 15¢

9

Label the dots.



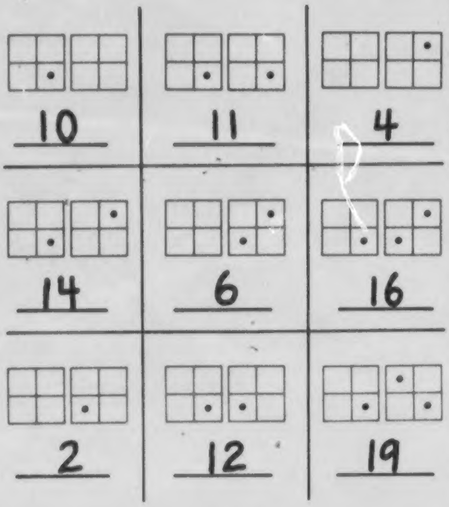
10

Complete this numeral chart.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

11

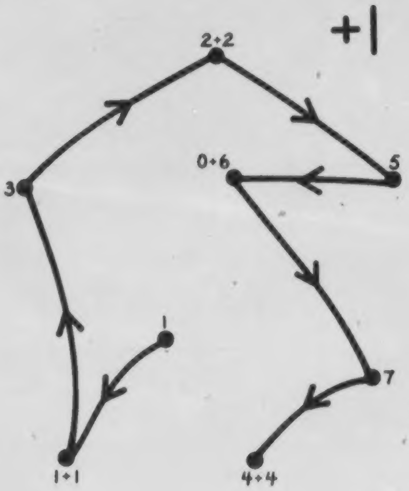
What number is on the Minicomputer?



10
11
4
14
6
16
2
12
19

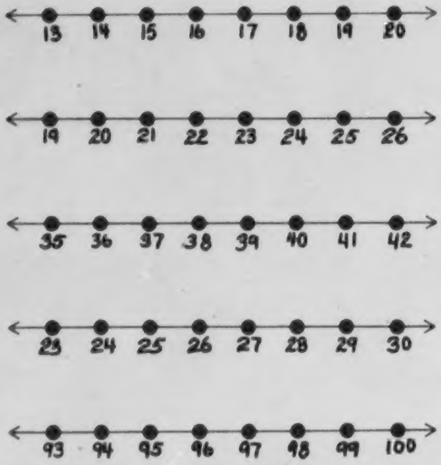
12

Draw all the missing red arrows.



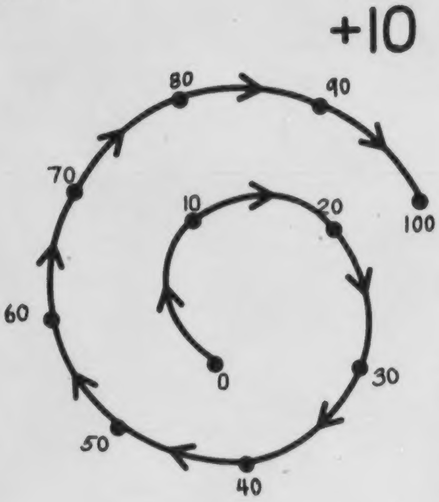
13

Label the dots on these number lines.



14

Label the dots.

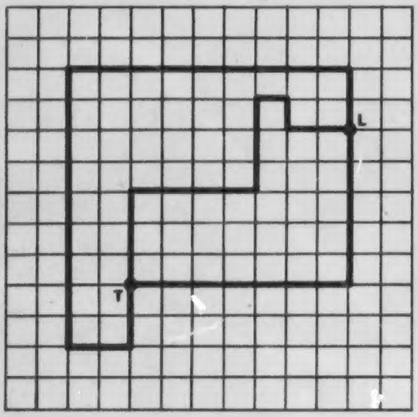


15

How long is the red path? 12 blocks

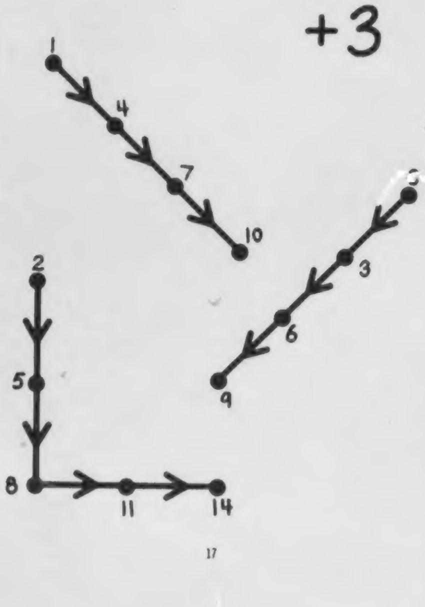
How long is the black path? 24 blocks

How long is the blue path? 14 blocks



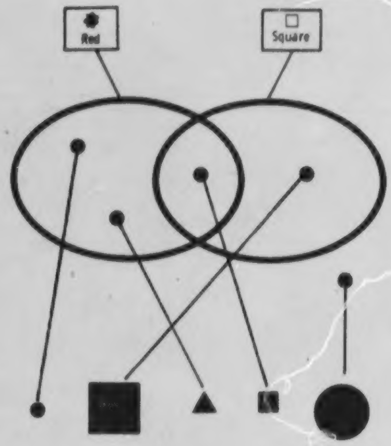
16

Label the dots.



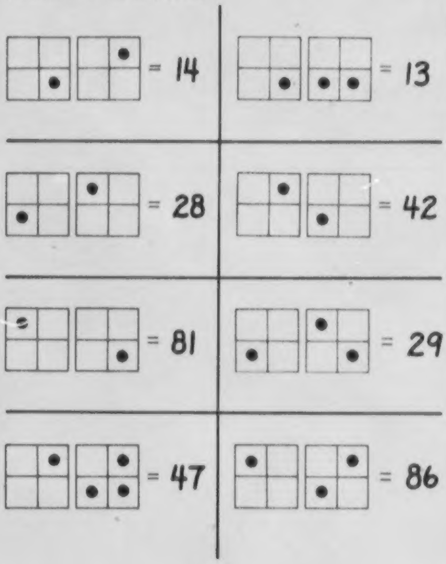
17

Match the dots with the shapes. One is done for you.



18

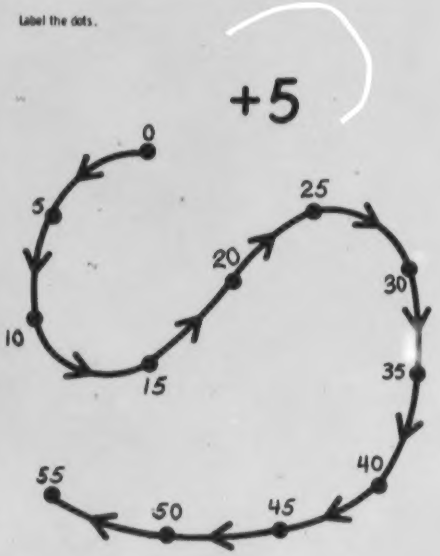
Put the number on the Minicomputer.



19

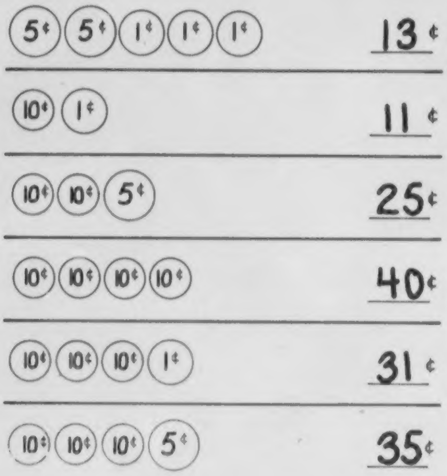
Standard configurations are used here; however, other solutions are possible.

Label the dots.



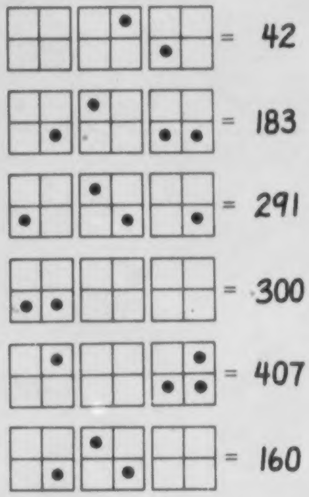
20

How much money?



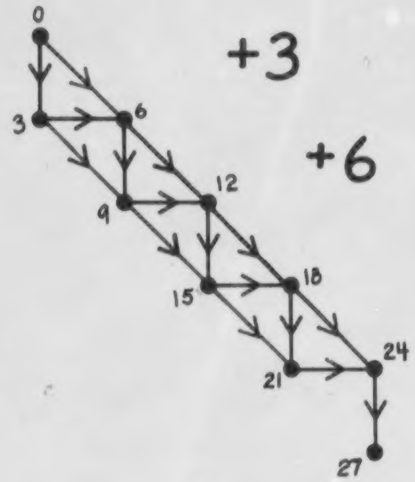
21

Put the number on the Minicomputer.

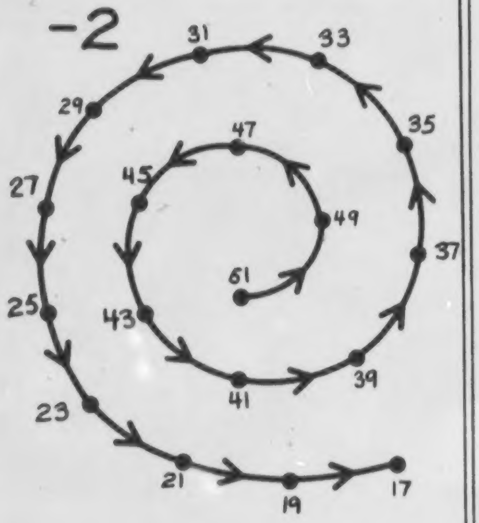


Standard configurations are used here; however, other solutions are possible.

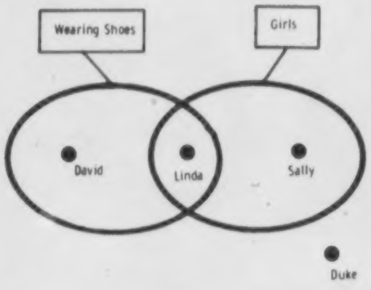
Label the dots. Draw all the missing red arrows.

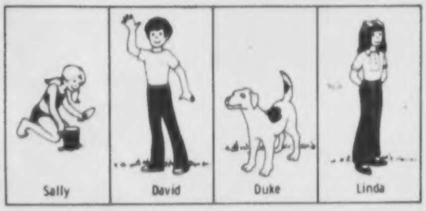


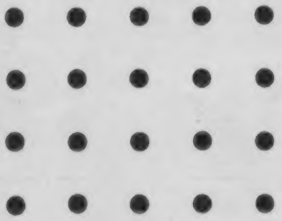
Label the dots.



Label the dots.







Write number stories about this dot picture. One is done for you.

4 + 4 + 4 + 4 + 4 = 20

4 × 5 = 20

5 × 4 = 20

5 + 5 + 5 + 5 = 20

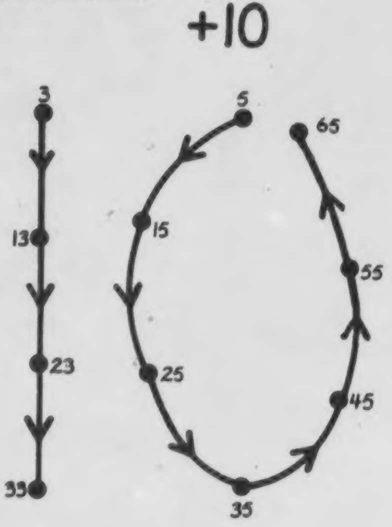
10 + 10 = 20

Other solutions are possible.

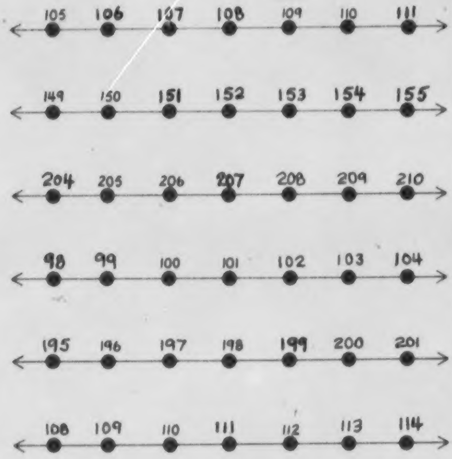
Complete this addition table.

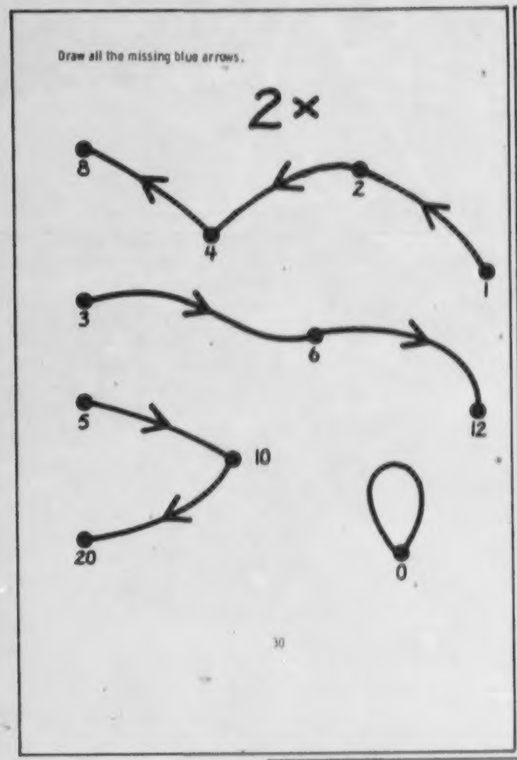
+	1	3	5	8
2	3	5	7	10
4	5	7	9	12
6	7	9	11	14
8	9	11	13	16

Draw all the missing red arrows.



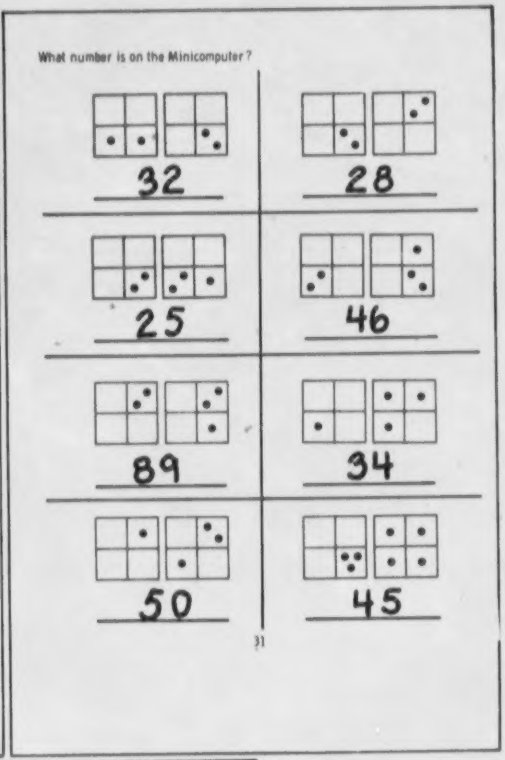
Label the dots on these number lines.





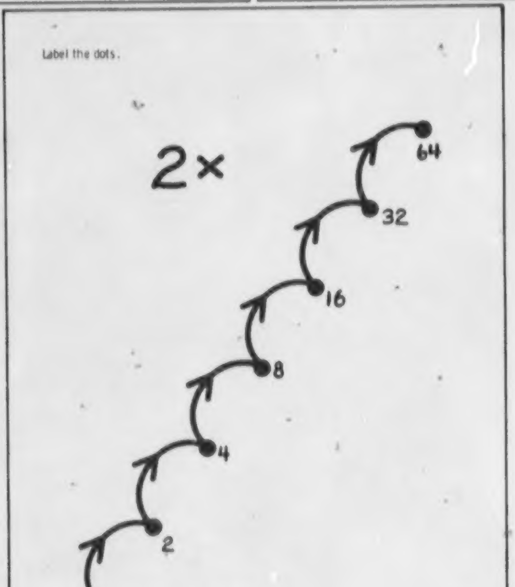
Draw all the missing blue arrows.

30



What number is on the Minicomputer?

31



Label the dots.

32

S26.1 Multiplication Problem #3

CAPSULE LESSON SUMMARY

In a story situation, present the problem of calculating "12 x 3". Use the Minicomputer to do the calculation. Picture the situation with an array of dots (twelve rows of three dots each). Relate this problem to that of calculating "3 x 12".

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Tell the following story, or one similar to it, to your class. Choose three students to be the "stars" of this story.

T: Ariel has a job at the zoo, feeding breakfast to Phil the Gorilla. What do you think Phil the Gorilla likes to have for breakfast?

Allow the class to discuss this question. You might also ask one of the students to describe a gorilla.

T: Phil the Gorilla is always very hungry in the morning, and Ariel knows that Phil's favorite food is doughnuts. Ariel also knows that if she doesn't bring Phil the Gorilla enough doughnuts, Phil will become very upset.

Phil the Gorilla likes to eat at least 36 doughnuts every morning, so Ariel is always careful to bring Phil at least 36 doughnuts. She worries that someday Phil the Gorilla will finish eating all of the doughnuts and still be hungry. What could Ariel do if this happens?

Allow the students to discuss this situation briefly.

S 26

T: Ariel's two good friends, José and Tony, each wanted a chance to feed Phil the Gorilla. Ariel decided to let José feed Phil on Saturday and to let Tony feed Phil on Sunday. Ariel told them to be sure and bring enough doughnuts or Phil would get very upset.

On Saturday, José walked in with twelve boxes of doughnuts. Phil the Gorilla smiled and licked his lips. "Wow!" Ariel said, "Phil is going to love you. How many doughnuts did you bring?" José explained that there were three doughnuts in each box, but that he didn't know how many doughnuts there were, all together. Do you think José brought enough doughnuts?

Allow the students to express their opinions. One of them will probably suggest using the Minicomputer to check this.

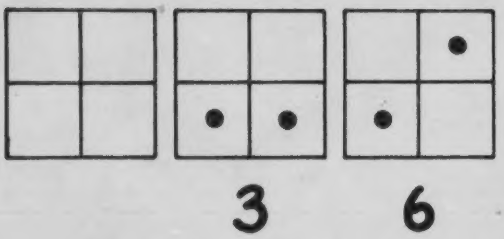
T: José brought twelve boxes, each containing three doughnuts. What calculation should we do on the Minicomputer?

A good response here is "12 x 3", but if someone suggests "3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3", accept it and write this number story on the board; then ask if anyone knows a shorter number story.

T: How should we do this on the Minicomputer?

Let the students tell you to put 3 on the Minicomputer twelve times. Put the checkers on the Minicomputer yourself, but ask the class to count the 3's as you put them on, to make sure that there are twelve of them.

Invite students to make plays on the Minicomputer; you may wish to let each student make several plays. Encourage them to make "8 + 2 = 10" plays whenever they can (otherwise, backward plays may later become necessary). When the standard configuration is on the Minicomputer, write the numeral below the Minicomputer and complete the number story on the board.



$12 \times 3 = 36$

Remove the checkers from the Minicomputer and erase the board before continuing.

T: Did José bring enough doughnuts for Phil the Gorilla? (Yes)

José gave Phil all twelve boxes of doughnuts and the gorilla ate the doughnuts very quickly while José and Ariel watched. When he had eaten the very last doughnut, Phil the Gorilla sat down and smiled. Ariel heaved a sigh of relief and said, "That was exactly enough. One less doughnut and Phil would have been very upset."

Let's draw a picture of the doughnuts José brought for Phil the Gorilla. How many boxes of doughnuts did José bring? (Twelve) And how many doughnuts were in each box? (Three)

Draw three large dots on the board.

T: These are the doughnuts in one of the boxes José brought for Phil.

Add another three dots to your drawing.

S 26

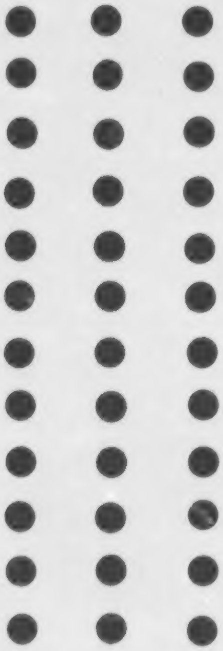
T: How many doughnuts in two boxes? (Six)

Draw three more dots.

T: 3 × 3 = . . . ?

S: 9.

Continue this activity until twelve rows of three each have been drawn.



T: 12 × 3 = . . . ? (36) Yes; this is one way to draw a picture of 12 × 3 doughnuts.

T: The next day, Tony came to feed Phil the Gorilla, but he brought only three boxes of doughnuts with him. Ariel looked worried. "How many doughnuts are in each of your boxes?" she asked. Tony told her that each box contained one dozen doughnuts.

T: How many doughnuts are in each of Tony's boxes? (Twelve) Do you think Tony brought enough doughnuts?

Again, allow the students to express their opinions until someone suggests using the Minicomputer.

T: Tony brought three boxes each containing twelve doughnuts. What calculation should we do on the Minicomputer?

A good response is "3 × 12", but if "12 + 12 + 12" is suggested, write this calculation on the board and ask if anyone knows a shorter way to write a calculation.

T: How can we do this on the Minicomputer?

S: Put 12 on the Minicomputer three times.

Ask each of three students to put 12 on the Minicomputer, and ask a fourth student to make some plays.

T: What number is on the Minicomputer? (36)
So, 3 × 12 = 36.

Complete the number story on the board.

$$3 \times 12 = 36$$

T: Did Tony bring enough doughnuts for Phil the Gorilla? (Yes) Phil ate all the doughnuts greedily but when he finished the last one, he was satisfied. Who brought Phil the Gorilla more doughnuts, Tony or José?

Encourage the students to explain that Tony and José brought the same number of doughnuts. Point to the dot picture.

S 26

T: Could this also be a picture of the doughnuts Tony brought for Phil? (Yes) How do you know?

Lead the class to observe that the dots in each column are for the doughnuts in one of Tony's boxes. Then combine the two number stories.

$$12 \times 3 = 36 = 3 \times 12$$

S26.2 An Addition Arrow Picture

CAPSULE LESSON SUMMARY

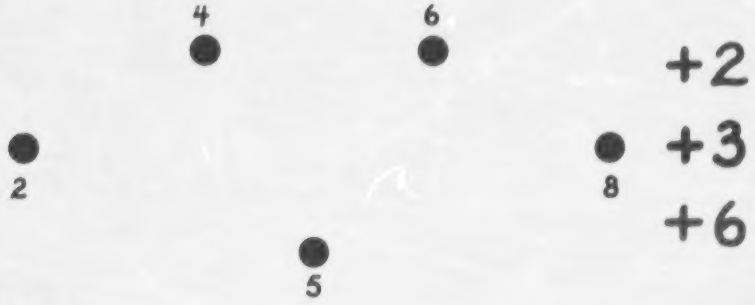
Draw arrows between labeled dots in an arrow picture. Discover that two dots connected by a + 6 arrow may also be connected by two + 3 arrows or by three + 2 arrows. Explore similar relationships in a second arrow picture, drawing arrows for + 1, + 2, + 3, and + 4.

MATERIALS

Teacher: Colored chalk
Student: Colored pencils; Worksheets S26.2 *, **, ***, and ****

DESCRIPTION OF LESSON

Distribute copies of Worksheet S26.2 * to the students and draw this picture on the board.



T: Who would like to draw an arrow in our arrow picture?

The following sample dialogue assumes that a blue arrow is drawn from 4 to 6.

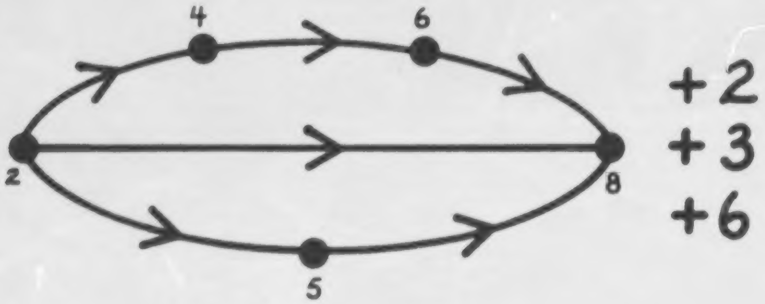
T: What is this blue arrow for?

S: + 2.

168

T: Yes; 4 (point to the dot) plus 2 (trace the arrow) is 6.
Who can draw another arrow?

Encourage the students to draw the arrows on their worksheets. Continue in this manner until all the red, blue, and green arrows are drawn.

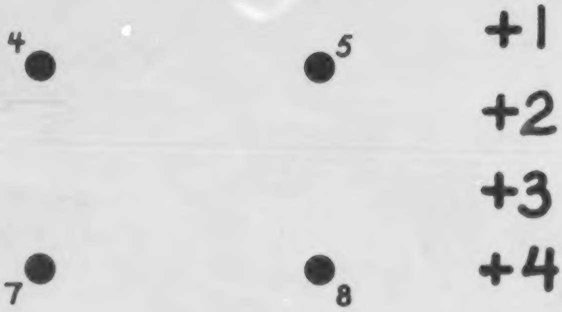


Students who finish quickly should be encouraged to write the number story associated with each arrow in this arrow picture.

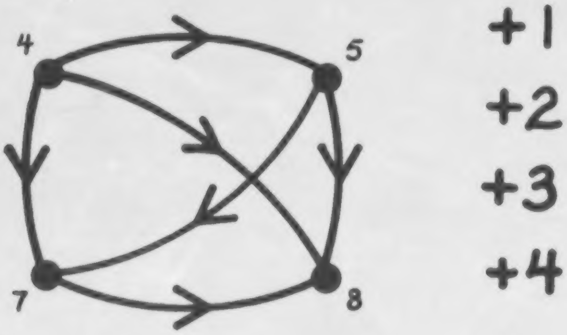
When most of the students have finished copying the arrow picture, ask them to look at Worksheet S26.2 **.

T: You can draw four different colors of arrows on this worksheet.
Be careful to use the correct color whenever you draw an arrow.
Try to draw as many arrows as you can.

Allow the students to work individually while you copy the problem onto the board.



Students who complete this arrow picture quickly should be given the three-and four-star worksheets. Observe the students as they work and provide help as it is needed. After a while, ask several students who have correctly drawn a particular arrow on their worksheets to draw the arrow on the board. Continue until the arrow picture is completed.

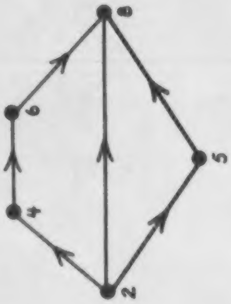


S 26.2 *

Name

Draw all the missing arrows.

+2 +3 +6

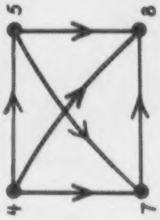


S 26.2 **

Name

Draw all the missing arrows.

+1 +2 +3 +4

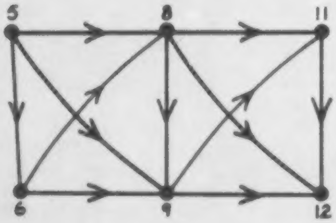


Name

S 26.2 ***

Draw all the missing arrows.

+1 +3
+2 +4

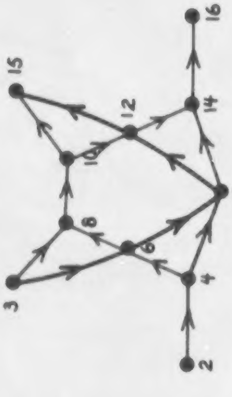


S 26.2 ****

Name

Draw all the missing arrows.

+2 +3 +5



S27.1 The Functions 2× and 1/2×

CAPSULE LESSON SUMMARY

Begin with mental arithmetic activities on doubling. Label the dots in a 2× arrow picture. Ask students to draw return arrows for $\frac{1}{2}$×. Extend the arrow picture to include larger numbers (optional).

MATERIALS

Teacher: Colored chalk
Student : None

DESCRIPTION OF LESSON

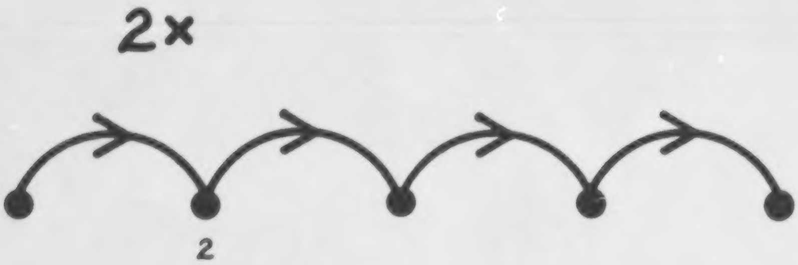
Begin this lesson with five to ten minutes of mental arithmetic activities similar to those described below. The pace of these activities should be brisk, and you should try to involve all of your students by varying the difficulty of your questions. If a student cannot answer, or answers incorrectly, simply ask a second student to respond. A sample dialogue is provided here.

T:	What number is 3 + 3?	S:	6.
	What number is 2 × 3?	S:	6.
	What is one-half of 6?	S:	3.
	10 + 10?	S:	20.
	2 × 10?	S:	20.
	$\frac{1}{2}$ × 20?	S:	10.
	2 + 2?	S:	4.
	2 × 2?	S:	4.
	$\frac{1}{2}$ × 4?	S:	2.
	7 + 7?	S:	14.
	2 × 7?	S:	14.
	$\frac{1}{2}$ × 14?	S:	7.

S 27

T:	50 + 50?	S:	100.
	2 × 50?	S:	100.
	$\frac{1}{2}$ × 100?	S:	50.

Draw this arrow picture on the board.



T: Point to the smallest number in this arrow picture. (The left-most dot) Show me with your fingers what the smallest number is. (1)

Ask a student to label the dot for 1. Then, point to this dot and trace the arrow from 1 to 2.

T: What number story does this part of the picture tell?

S: "2 × 1 = 2".

T: Yes. Now, point to the largest number in this arrow picture. (The right-most dot) If you know what this number is, whisper it to me.

Accept several whispers and compliment any students who know that the largest number is 16.

T: Who would like to label a dot in our arrow picture?

As each dot is labeled, ask a student to read the corresponding number story. When the dot for 4 is labeled, for example, the number story is "$2 \times 2 = 4$". Continue until every dot has been labeled and then write "$\frac{1}{2}\times$" near the arrow picture.

T: Who can draw an arrow for $\frac{1}{2}\times$ (read "one-half of") in this arrow picture?

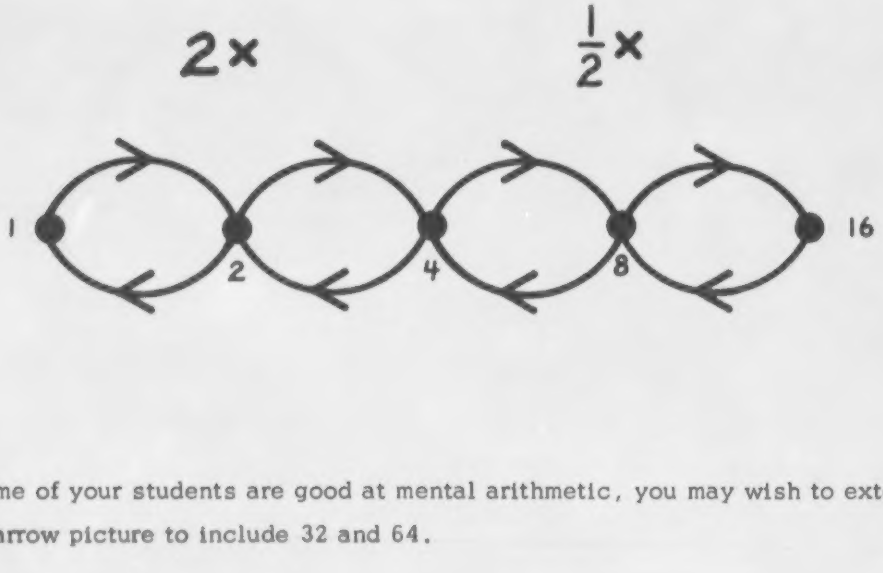
If none of the students is able to draw a $\frac{1}{2}\times$ arrow, point to "4" and hold up four fingers.

T: What is one-half of 4? $2 + 2 = 4$, so one-half of 4 is . . . ?

S: 2.

T: Who can draw this arrow in our arrow picture?

Continue in this manner until the arrow picture is complete.



If some of your students are good at mental arithmetic, you may wish to extend this arrow picture to include 32 and 64.

S 27

S27.2 Same First Initial

CAPSULE LESSON SUMMARY

Draw an arrow picture of the relation "I have the same first initial as you" where the dots are for students in the class.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

Refer to the alphabetical class list you prepared for Lesson F73.1 Same First Initial #1[*] and choose three groups of students as follows:

- six students with the same first initial (such as "M");
- three students with the same first initial (such as "C");
- two students with the same first initial (such as "K").

The lesson description here assumes the three groups are as described above; however, you may find it necessary to adapt the lesson because your class does not contain groups with the suggested composition. In any case, substitute the names of students in your class for those given here.

Before the lesson begins, draw an arrow picture (on some paper) of the students you choose, letting the arrows stand for "I have the same first initial as you". Then, erase all of the students' names and most of the arrows (until just enough arrows remain for each group of students to be identified). At the beginning of the lesson, for example, your arrow picture might look like the one in the next illustration.

Copy your arrow picture on the board.

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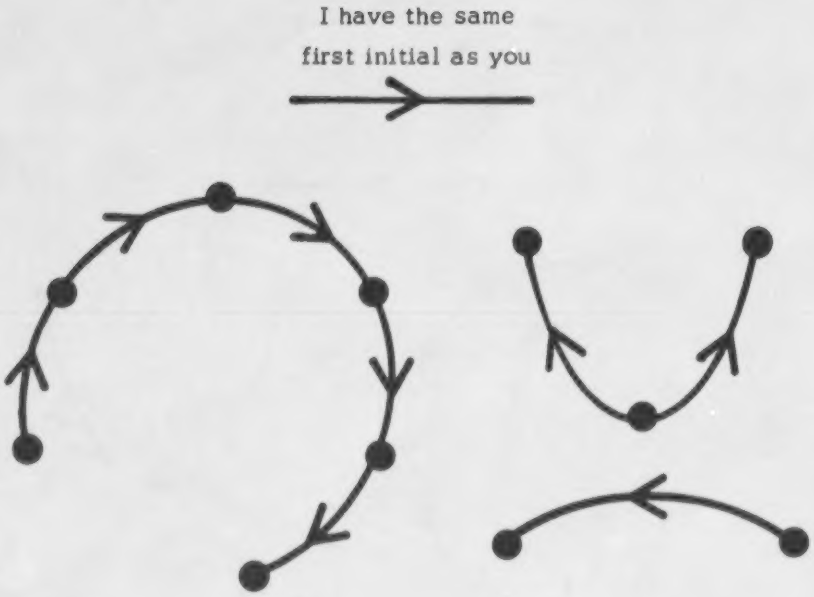
[*] This lesson may be found on page 510 of CSMP Mathematics for the First Grade, Part I, Teacher's Guide.



T: These dots are for students in this class. Who sees himself or herself in this picture?

Send a student to the board to point to his or her dot. Label this dot with the student's name.

T: Chris thinks this is his dot. Do you think this dot could be for Chris?

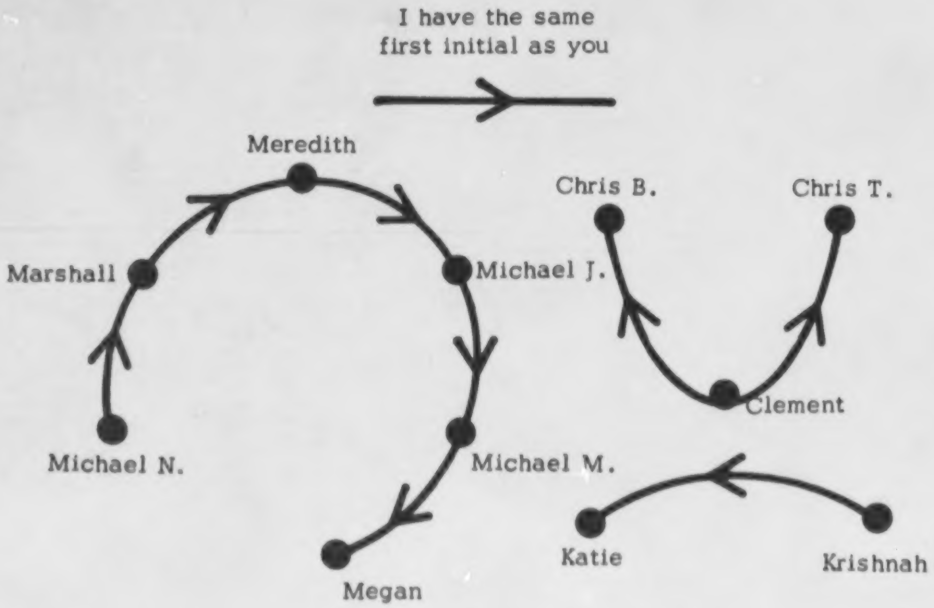
Allow the students to discuss this. Encourage them to explain why this particular dot can or cannot be for Chris. If the class concludes that the dot cannot be for Chris, erase the label.

T: Who else believes that he or she is in this picture?

Continue in this manner, asking volunteers to identify their dots. Call on any students who volunteer, rather than just those you had originally chosen. It is possible that a different group of two students will replace your chosen group of two students with the same first initial.

S 27

Continue until all of the dots have been labeled.



Point to the dots for the students in the group of three.

T: Chris B., Chris T., and Clement say these dots are for them. Could these three dots be for anyone else?

If appropriate, someone should suggest that these dots could also have been for Ricky, Rhonda, and Robin. A student may suggest that these dots could have been for (in this sample dialogue) three students such as Marshall, Megan, and Michael J. Accept this as being possible but remind the class that those students are already represented in the picture, and that their dots would first have to be erased (i.e., the same student may not have two dots in the picture).

Point next to the dots for the students in the group of two.

T: Katie and Krishnah say these two dots are for them. Could these two dots be for anyone else?

Accept as a correct response any pair of students whose first initials are identical.

Point to the dots for the students in the group of six.

T: Could these dots be for anyone else?

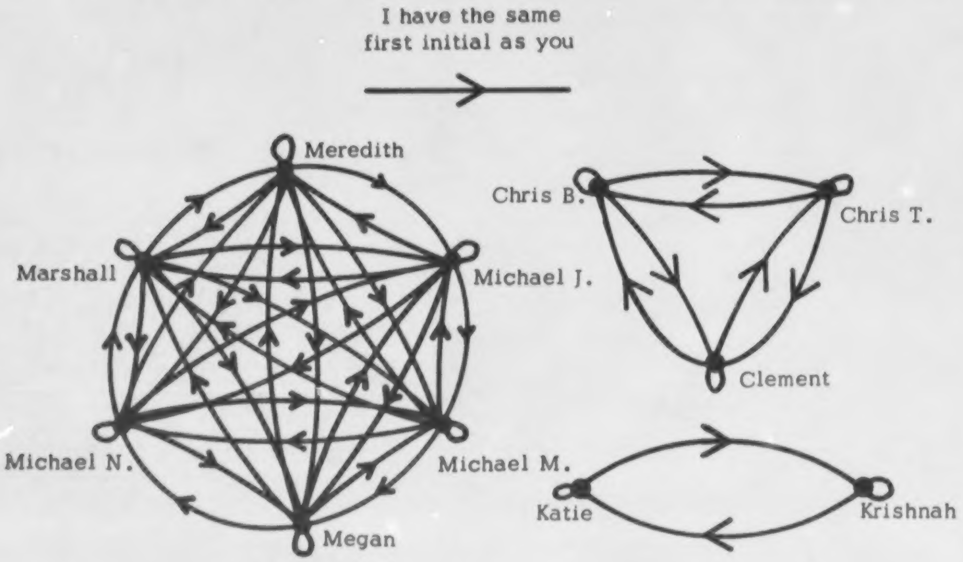
Your class might contain a second group of six such students, in which case the class would conclude the dots could be for those students. Otherwise, the class should conclude that these dots can only be for (in this sample dialogue) the students whose first initial is "M".

T: Could we draw any more red arrows?

Send students to the board to draw arrows. As each arrow is drawn, ask the student to tell you what that arrow is saying. An arrow from Katie to Krishnah, for example, can be read in several ways:

- "Katie has the same first initial as Krishnah."
- "Katie says,'I have the same first initial as Krishnah.'"
- "Katie says to Krishnah,'I have the same first initial as you.'"

Continue this activity for as long as you feel is appropriate. Do not insist that all missing arrows be drawn, but point out to the students that loops may also be drawn. For your information, a completed arrow picture is shown below.



S 28

S28.1 Eli's Magic Peanuts #1

CAPSULE LESSON SUMMARY

Introduce negative numbers via a story about Eli the Elephant, who is confused by magic peanuts he finds. (When a magic peanut meets a regular peanut, both disappear.) Explore the situation further in number stories such as "$5 + \hat{5} = 0$" and "$7 + \hat{4} = 3$", where the notation "^" is used to represent magic peanuts.

MATERIALS

Teacher: None
Student: None

DESCRIPTION OF LESSON

T: There is an elephant named "Eli" who lives in the jungle and is always very hungry. What do you think is Eli's favorite food?

Accept suggestions from the students.

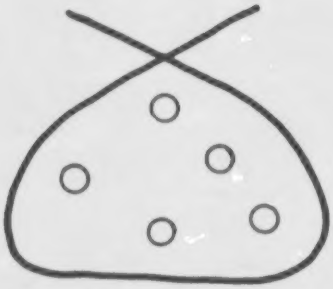
T: Eli's favorite food is peanuts. He likes peanuts so much that he always carries a little bag of peanuts with him wherever he goes. One day, while walking through the jungle, Eli spotted a special peanut bush he had never seen before. Eli didn't know it, but the peanuts from this bush were magic!

Eli gathered some of the magic peanuts and put them in his bag with the other peanuts. What do you suppose is so special about magic peanuts?

Allow the students to discuss this briefly.

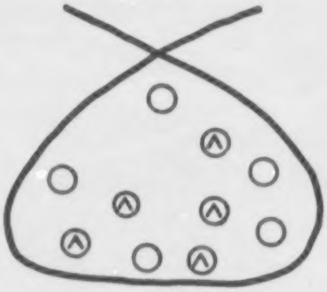
T: Whenever a magic peanut comes near a regular peanut, both peanuts suddenly disappear!

Draw this picture on the board.



T: This is Eli's bag with five regular peanuts in it. But Eli also put some magic peanuts into his bag; here are the magic peanuts.

Continue your drawing.



T: How many magic peanuts did Eli put into his bag?

S: Five.

You may wish the class, as a group, to count each magic peanut as you point to it.

S 28

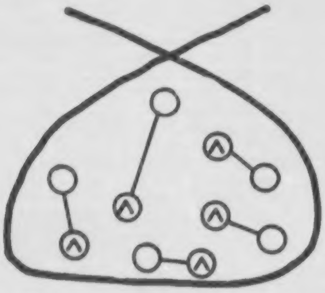
T: When Eli returned home, he was very hungry from walking through the jungle all day; he decided to eat some peanuts. When he opened his bag, he was very surprised. How many peanuts were in the bag, do you think?

S: None; the bag was empty.

S: All the peanuts disappeared!

T: That's right. There was one magic peanut for every regular peanut, so all of the peanuts disappeared.

Add these connecting lines to your picture, pairing magic peanuts with regular ones. Next to the picture, write the appropriate number story.



$5 + \hat{5} =$

T: Five regular peanuts plus five magic peanuts is . . . ?

S: No peanuts.

S: 0!

Complete your number story on the board.

$$5 + \hat{5} = 0$$

T: Poor Eli was very puzzled. He didn't know the secret of the magic peanuts and he couldn't imagine where his peanuts had gone! He was still very hungry, so he went looking for more peanuts. This time, he found seven regular peanuts and put them into his bag.

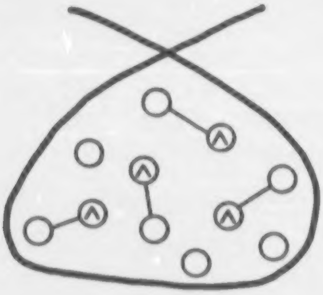
Erase your previous picture and draw this new one.

T: Without knowing it, Eli also put four magic peanuts into his bag.

Add these four magic peanuts to your drawing.

T: When Eli returned home, what do you suppose he found when he opened his bag?

Ask several students to explain their answers, and then choose volunteers to pair up regular peanuts with the magic ones.



S 28

Write this number story next to the picture.

$$7 + \hat{4} =$$

T: Seven regular peanuts plus four magic peanuts is . . . ?

S: Three!

T: Three what?

S: Three regular peanuts.

Complete the number story.

$$7 + \hat{4} = 3$$

S28.2 "Is Less Than" Relation

CAPSULE LESSON SUMMARY

Relate pairs of numbers given in non-standard form (e.g., "62 + 4" and "62 + 12"), by writing " < " or " > " or " = " between them. Draw arrows for "I am less than you" between dots labeled with non-standard names.

MATERIALS

Teacher: Colored chalk
Student : Colored pencils ; Worksheets S28.2* and **

DESCRIPTION OF LESSON

Exercise 1

Using the indicated non-standard names, write these six numbers on the board.

$62 + 4$	$62 + 12$
$87 + 16$	$87 + 9$
$66 + 35$	$35 + 66$

Point to the first horizontal line and ask:

T: Can anyone draw Goldy's mouth, or an equals sign, without doing the calculation?

Ask a volunteer to come to the board and do so.

$$62 + 4 < 62 + 12$$

T: How do you know?

S: 4 is less than 12; so 62 + 4 must be less than 62 + 12.

If many of the students fail to see this, use the 0-109 Numeral Chart to demonstrate it or use the Minicomputer to perform both calculations. If necessary, ask again for someone to draw Goldy's mouth.

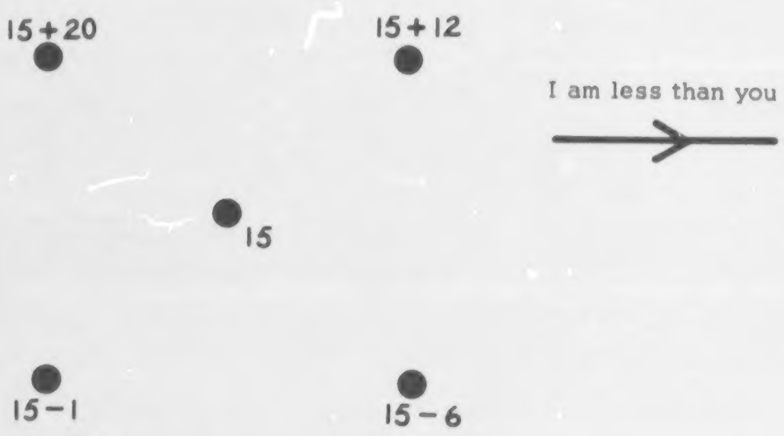
Repeat this process for the numbers in the second and third lines.

$$87 + 16 > 87 + 9$$

$$66 + 35 = 35 + 66$$

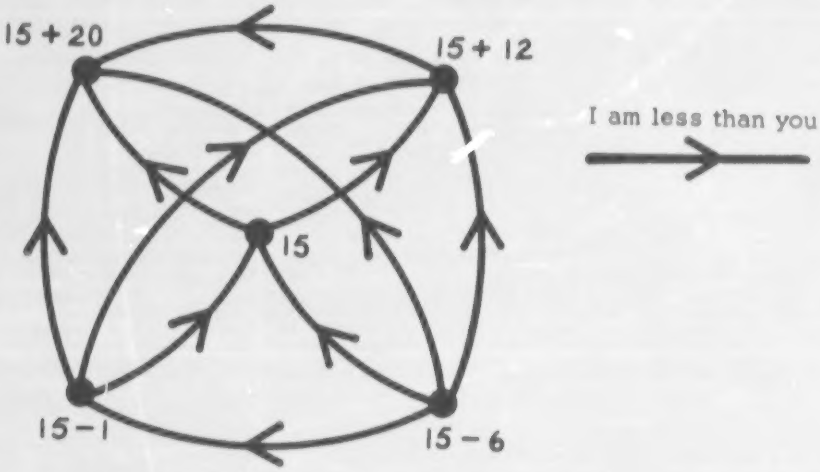
Exercise 2

Erase the previous number stories from the board and draw this picture.



T: Who can show me where to draw an arrow for "I am less than you"?

Ask several students to suggest where arrows may be drawn and then, draw the arrows yourself. If the students find this difficult, you may prefer to ask them for the standard name of each number, adding these to your picture.



Distribute Worksheets S28* and ** and explain to the students that they should draw arrows for "I am less than you".

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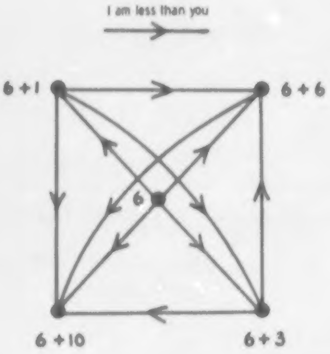
Name ____________________

S 28.2 *

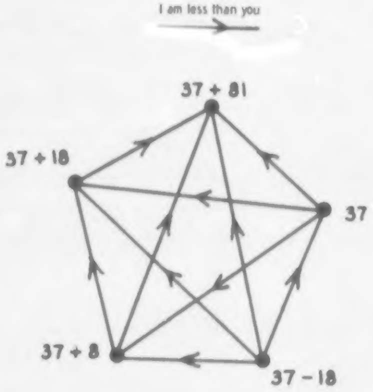
Draw all the missing red arrows.



Name ____________________

S 28.2 **

Draw all the missing red arrows.



S29.1 Subtraction Problem #3

CAPSULE LESSON SUMMARY

Present two stories in which there are subtraction problems and use the Minicomputer to do the calculations. Write the related number stories. Conclude by solving a subtraction problem given only its incomplete number story.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Tell the following stories to your class, choosing several students to "star" in them.

T: Shannon has an aquarium at home, with 57 guppies in it. Who knows what a guppy is?

Allow the students to comment. The guppy is a small fish which is known for being especially prolific.

T: Yesterday Shannon decided that her aquarium had too many fish in it so she gave 16 of her guppies to Gabrielle. How many guppies did Shannon have left? (41)

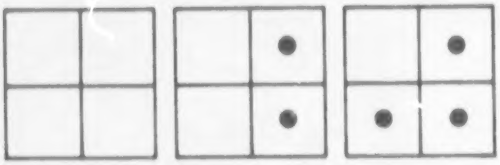
Invite students to offer their suggestions.

T: What number story could we write about Shannon's guppies?

$$57-16=$$

S 29

Display three Minicomputer boards and ask a volunteer to put 57 on the Minicomputer.

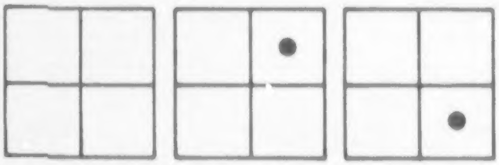


T: How can we do the calculation?

S: Take away 16.

T: Do we need to make any plays first? (No)

Send a student to the Minicomputer to take away 16. Then complete the number story.



57 − 16=41

T: 57 take away 16 equals 41. Who has more guppies now, Shannon or Gabrielle?

S: Shannon does.

Remove all checkers from the Minicomputer before continuing to the next story.

T: Wally's uncle raises rabbits. When Wally's family visited him last weekend, Wally's uncle had 30 rabbits in pens near the garage. Why might Wally's uncle raise rabbits?

During this discussion, explain that many people raise rabbits to sell as pets.

T: While Wally was at his uncle's house, eight of the rabbits were sold. How many rabbits did Wally's uncle have left?

Allow several students to suggest an answer.

T: What number story could we write about the rabbits?

$$\begin{array}{r} 30 \\ -8 \\ \hline \end{array}$$

Ask a volunteer to put 30 on the Minicomputer.

T: What should we do next?

S: Take away 8; but first we need to make a play.

T: Yes; there is no checker on the 8-square, so we must make a play which will put a checker there. What play should we make?

S: A backward play.

S: "10 = 8 + 2".

Ask one student to make this play on the Minicomputer, and another to take away 8.

T: How many rabbits did Wally's uncle have left? (22) Who would like to complete our number story on the board?

$$\begin{array}{r} 30 \\ -8 \\ \hline 22 \end{array}$$

S 29

Remove all checkers from the Minicomputer and erase the board before continuing. Then, write this calculation on the board.

69 − 14 =

T: What number is 69 - 14? (55)

Record several of the students' responses before doing the calculation on the Minicomputer. Then complete the number story on the board. Students who suggested the correct answer might be asked to explain how they discovered this solution.

S29.2 Number Friends #1

CAPSULE LESSON SUMMARY

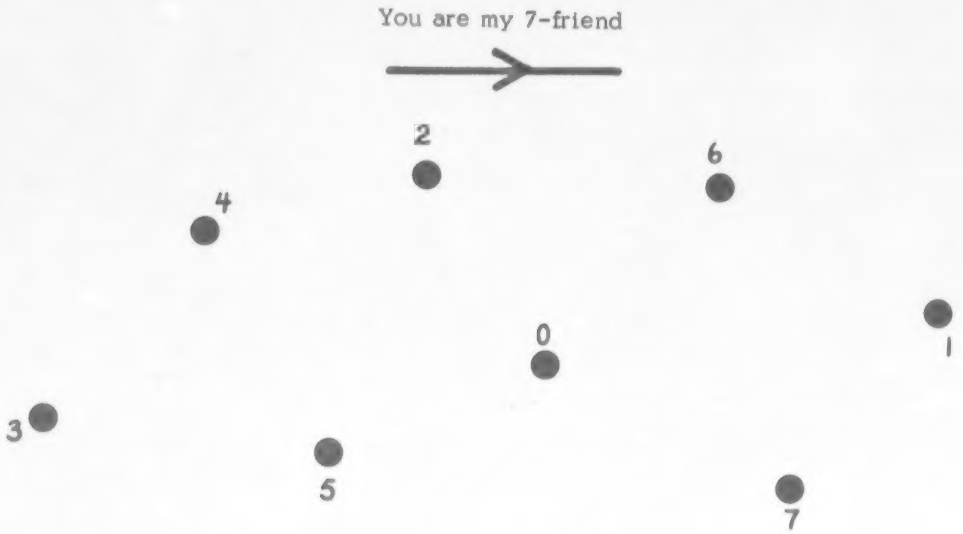
Draw arrows for "You are my 7-friend" between labeled dots. (Two numbers are 7-friends if and only if their sum is 7.)

MATERIALS

Teacher: Colored chalk
Student : Colored pencils ; Worksheets S29.2* and **

DESCRIPTION OF LESSON

Begin the lesson by drawing this picture on the board.



T: These numbers are playing a new game. Each number points to its 7-friend.

In red, draw an arrow from 2 to 5.

T: 2 is saying to 5, "You are my 7-friend." Why would 5 be 2's 7-friend?

S 29

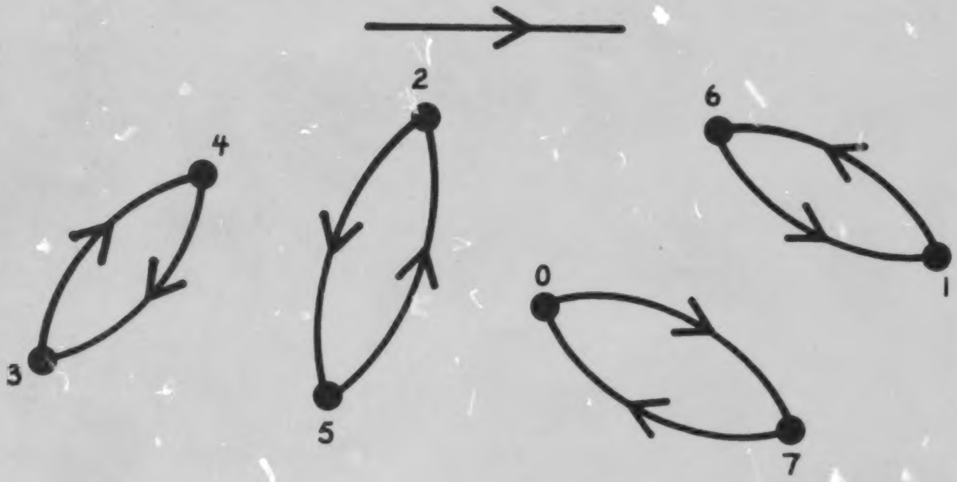
Allow the students to offer opinions.

S: 5 is 2's 7-friend because 2 + 5 = 7.

T: Correct; where else could we draw an arrow for "You are my 7-friend"?

Send volunteers to the board to draw arrows. Each time an arrow is drawn, ask the student to explain why it is correct. Continue until the arrow picture is completed.

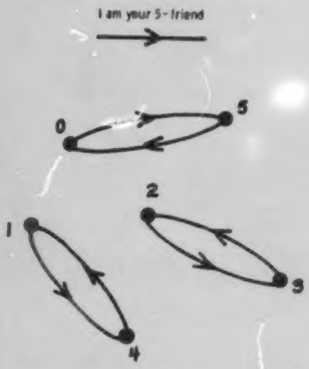
You are my 7-friend



Worksheets S29.2* and ** are available. Ask the students to draw all the missing red arrows. Students who finish quickly should be asked to draw their own arrow pictures with arrows for "You are my 15-friend". If students are aware of negative numbers, some may discover that $\hat{1}$ and 16 are 15-friends.

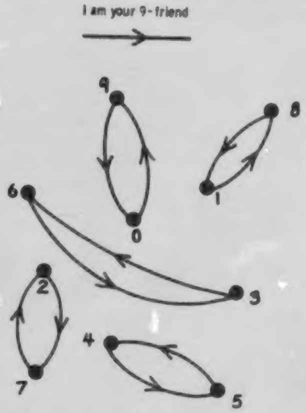
Name ____________________ **S 29.2** *

Draw all the missing red arrows.



Name ____________________ **S 29.2** **

Draw all the missing blue arrows.



S30 Adjustment Day #3

NOTE: See page 16, Section One NOTES TO THE TEACHER in CSMP Mathematics for the First Grade, Part I for a full explanation of the purpose of scheduled adjustment days.

On this day you may wish to repeat a previous lesson, either for a small group of students or for the entire class. Much of the basic content in a particular lesson can be made to appear completely different by adjusting the story line and/or the numbers in the story. Consider the needs of your class in choosing lessons to repeat.

The Number Line Game (S24.2) would be an excellent activity for this and any future adjustment day, because it gives students practice in estimation, in reading numerals, and in ordering numbers on the number line. You can easily adjust the game to your students' expanding knowledge of numbers by choosing a different interval for the exercise.

Variations of Exercise 2 from S23 Introduction to Even and Odd Numbers #1 (see page 126) could be used from time to time to strengthen the students' understanding of "even" and "odd". These can be simple five or ten minute activities.

Variation 1: Draw two strings on the board labeled "even" and "odd". Invite individual students either to locate a specific number in the strings, for example 17, or to choose a number to put in one of the strings; for example, put an odd number in the string picture.

Variation 2: Set up four Minicomputer boards and ask a student to put on any odd number, or any even number. From time to time, ask a student to put on a particular number and to tell whether it is even or odd. If students have difficulty, remind the class of the way in which the 1-square helps distinguish odd numbers from even numbers.

If you omitted the worksheets from any previous lesson, you may wish to distribute them today, after an appropriate warm-up activity. This would also be a good time to allow the students to look at the storybook, "I Am A Very Happy Boy", if they have not already done so.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with S31 Three Strings #1.

EARLY WARNING !

Among the next nine classroom lessons are some which require extra preparation time, or which make use of materials not included with the CSMP classroom set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more often in a nine-day period.)

S33 Introduction to Even and Odd Numbers #2: students' street addresses (See S33, page 198 for more information.)

S36.1 Estimation and an Addition Problem #2: transparent jar containing 150-200 dried beans, dried peas, beads or something similar; small strips of paper for students

S36.2 Booker's Bakery: ruler or yardstick; tape; (Cut out geometrical shapes from Poster #1 for First Grade, Part II, before the lesson begins.)

S37.2 The String Game with Two Strings #1: (The team board and game board must be prepared before the lesson begins.)

S38.1 Coin Problem #2: small opaque container; two dimes and two nickels

S39.1 Length #2: meter stick

S 31

S31 Three Strings #1

CAPSULE LESSON SUMMARY

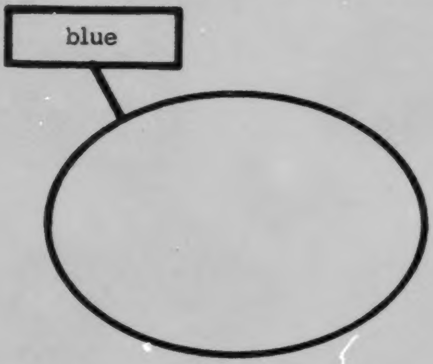
Review the language of strings for classifying A-blocks. Arrange three strings --- one for first-graders, one for boys, and one for students wearing sneakers today --- so that every student in the class may be placed in the string picture.

MATERIALS

Teacher: A-Block set; colored chalk
Student: None

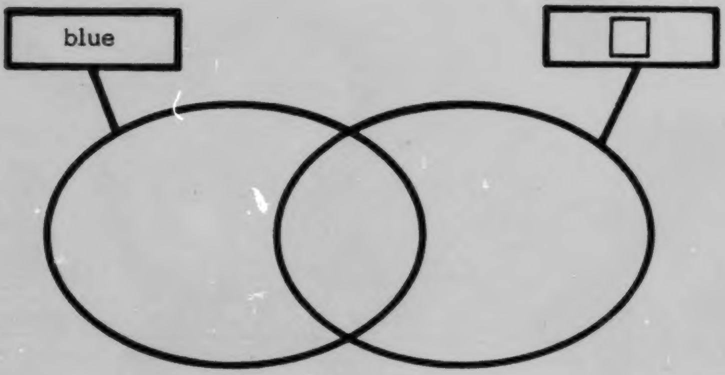
DESCRIPTION OF LESSON

Draw a large, red string on the board and label it as shown.



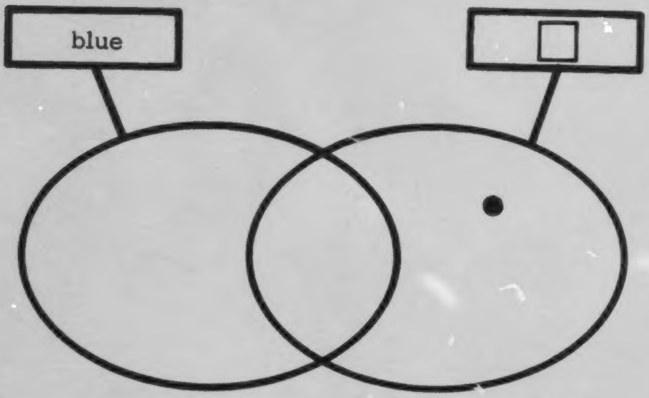
T: This string is for all blue A-blocks. Who can draw and label a string for all of the square A-blocks?

Ask a volunteer to do so.



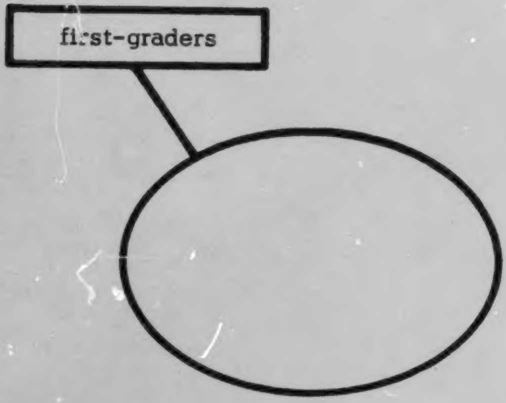
Choose an A-block piece (such as a red square) and display it to the class.

T: Who can draw a dot in our picture for this A-block?



The class should help judge the correctness of the dot. Continue choosing A-blocks and calling on students to draw dots for the pieces until at least one dot has been drawn in each of the four regions of the string picture.

Erase the picture and begin this new one.



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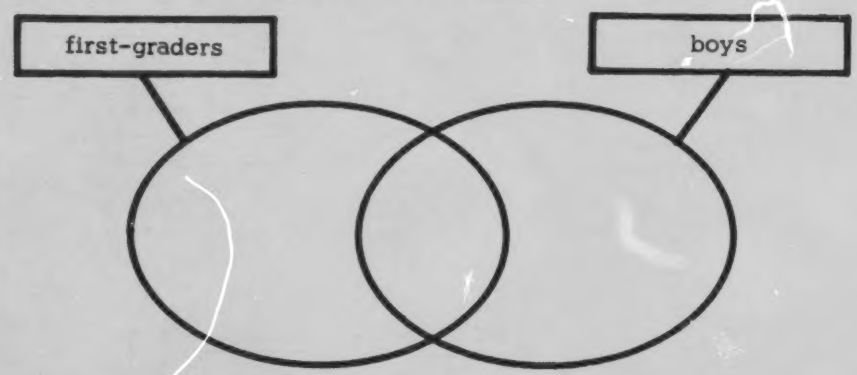
S 31

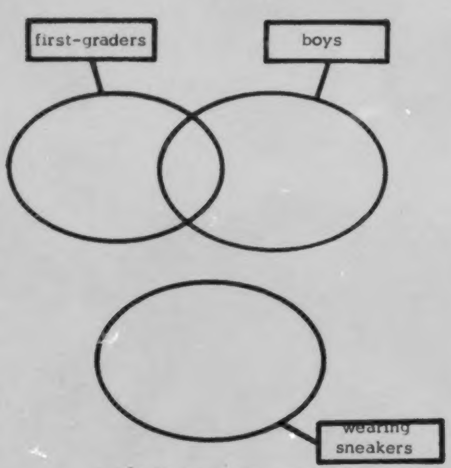
T: This string is for all of the first-graders at our school. Who would like to draw a string for all of the boys at our school?



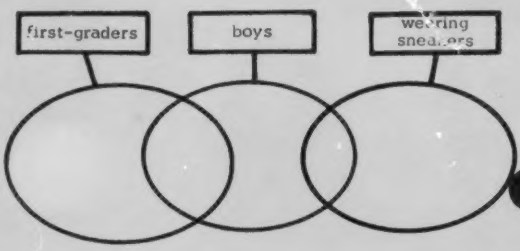
Ask several students, one at a time, to draw dots for themselves. When several students have correctly located themselves, erase all of the dots and ask:

T: Who can draw a third string for all of the students who are wearing sneakers today?

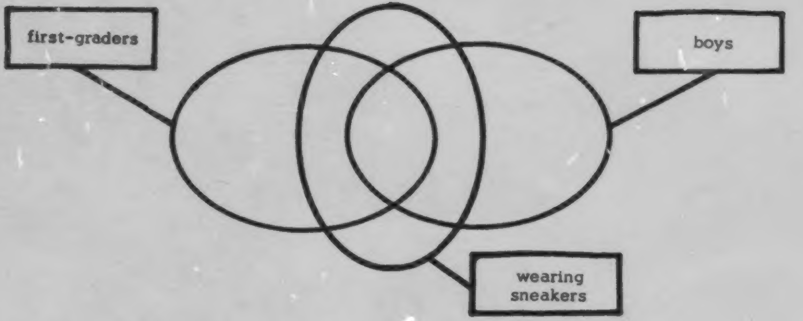
NOTE: At this point, an incorrect placement of this third string by a student may actually prove quite useful in demonstrating why we draw the string picture the way we do; i.e., if the picture were drawn in any other way, some students could not be correctly placed in the picture. In the case of the three possible (and incorrect) responses which follow, you might ask where to place . . .



. . . a boy wearing sneakers.

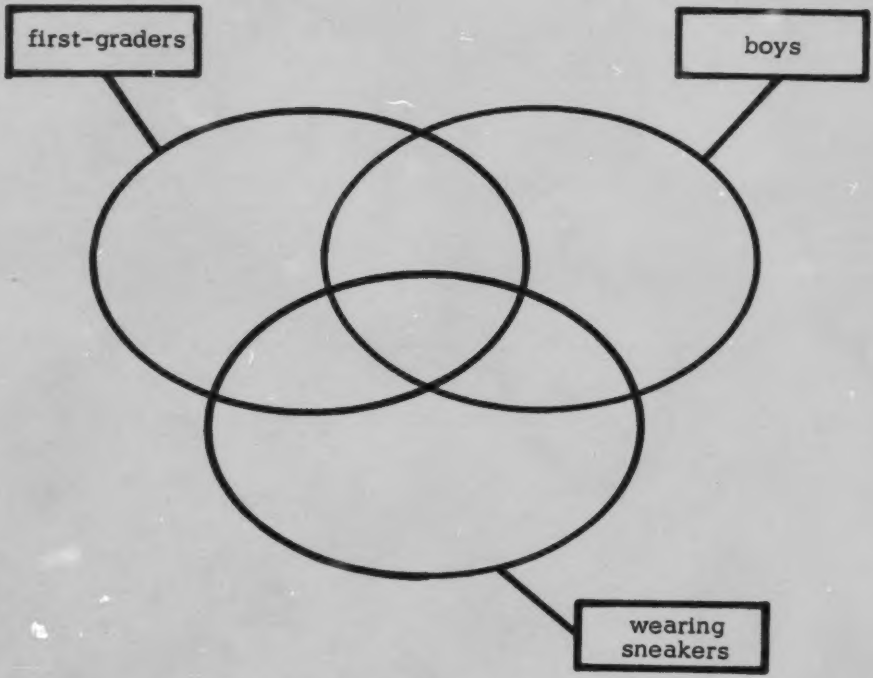


. . . a first-grader wearing sneakers.



. . . a first-grade boy not wearing sneakers.

With the help of your questions, the class should agree that the third string should be drawn as shown below.



Ask several students to locate dots for themselves. Then, one at a time, draw dots in each of the eight possible regions of the picture and say:

T: If this dot could be for you, stand up.

When you have finished, ask if everyone had a chance to stand up. If some say

200

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they did not, help those students to locate their dots.

T: Did anyone stand more than once?

If so, help those students determine exactly when they should have stood. (Each student should stand exactly once.)

S32.1 Multiplication Story

CAPSULE LESSON SUMMARY

Divide 3 x 29 pieces of candy among 26 students. How many pieces will each student receive? How many pieces will be left over?

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Begin the lesson by counting as a group by threes, and then by fives. Continue by playing two or three games of "Guess My Rule," as described in Lesson S16.1 (pp. 89-90).

Tell the following story or a similar one, substituting the name of a student in your class. Adjust the story, if necessary, so that each bag of candy (as described in the story) contains exactly three more candies than there are students in your class. The sample dialogue here assumes that there are 26 students in the class.

T: Last week, Cathy went with her mother to a big department store hoping to find some candy to bring to school. When she found what she wanted, she bought three bags of candy; each bag had 29 candies in it. How can we find out how many pieces of candy she has to bring to school?

S: Put 29 on the Minicomputer three times.

T: What calculation would we do?

S: "29 + 29 + 29".

S: "3 x 29".

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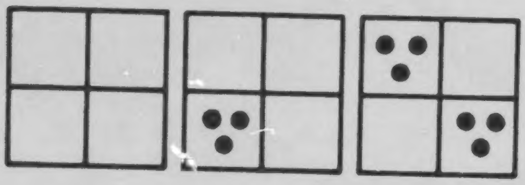
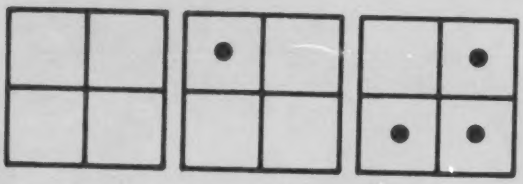
Write the multiplication problem on the board and ask three volunteers to each put 29 on the Minicomputer.



$3 \times 29 =$

Allow the students to make plays until the number (87) is shown in its standard configuration and then ask a student to complete the number story.

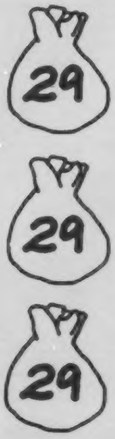


$3 \times 29 = 87$

T: Cathy wants to share her candy with all of the students in our class; how many students are there? (26) If each of you receives the same number of candies, how many would each of you get?

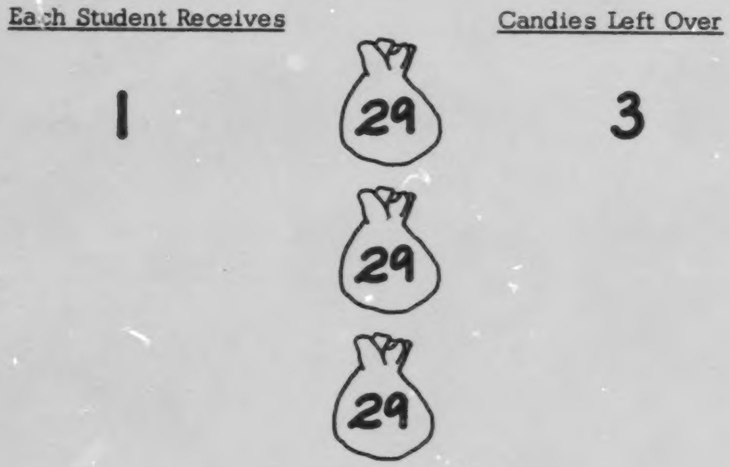
Any students who know the answer (three) should be asked how they arrived at it. After a brief discussion, however, continue by drawing the following picture on the board.

Each Student Receives   Candies Left Over



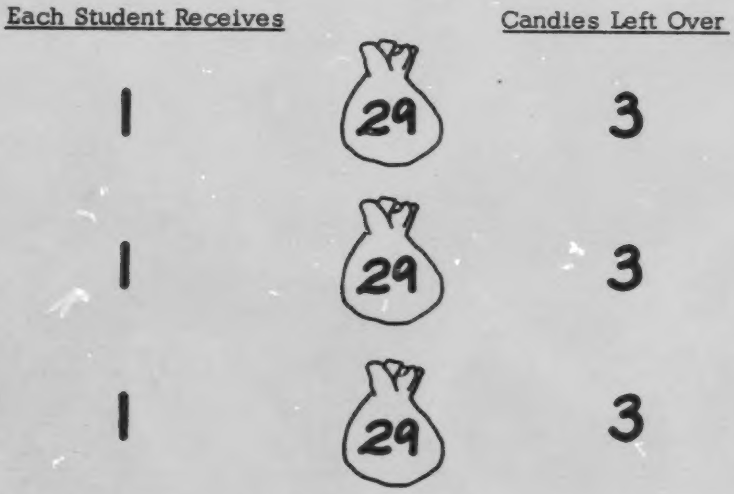
T: Here are the three bags of candy. Can we give each student a piece from the first bag? (Yes) How many pieces does each student receive? (One) Will any pieces from this bag be left over? How many? (Three)

Add this information to your drawing, as shown.



T: How many pieces of candy from the second bag does each student receive? (One) And how many are left over? (Three)

Add this information to your drawing and repeat these questions, completing the picture.



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T: How many pieces of candy does each student receive, in all?

S: Three.

T: In all, how many pieces are left over?

S: Nine.

S32.2 Frogs in a Pond #1

CAPSULE LESSON SUMMARY

Find common multiples of 3 and 5 in the context of a story. Two frogs start at the first of a long line of numbered lily pads. The large frog always hops five pads at a time; the other always hops three pads at a time. On which pads will they meet?

MATERIALS

Teacher: Colored chalk
Student: None

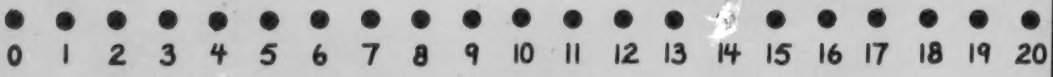
DESCRIPTION OF LESSON

Tell the following story, or one similar to it, to your class.

T: This is a story about two frogs who lived near the edge of a large, clear pond. On the surface of the water, there were many lily pads that stretched from the shore far out into the middle of the pond.

One day, when they were not very busy, the frogs decided to give each lily pad a number.

Draw this picture on the chalkboard.



T: This lily pad (point to "0") is next to the shore. The lily pads continue far out into the pond; I've only drawn some of them.

One day, the two frogs were sitting on lily pad "0" when they decided to hop out into the pond for lunch. One of the frogs was very large and always hopped five pads at a time. The other frog was smaller and always hopped three pads at a time.

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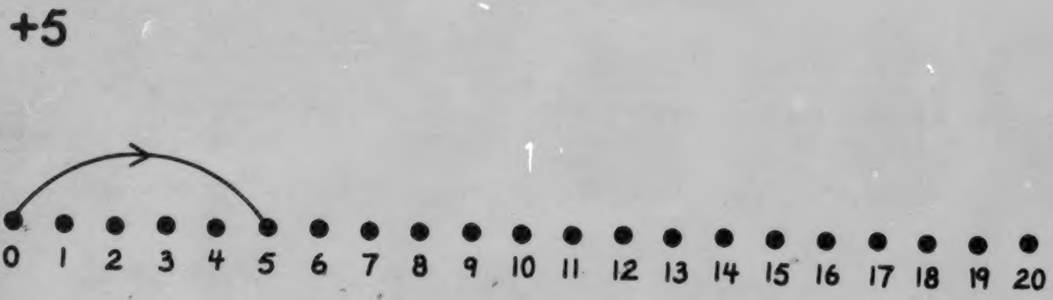
T: Is there a lily pad on which both frogs will land, to have lunch together?

Allow a few moments for the students to discuss this and to express their opinions before you continue.

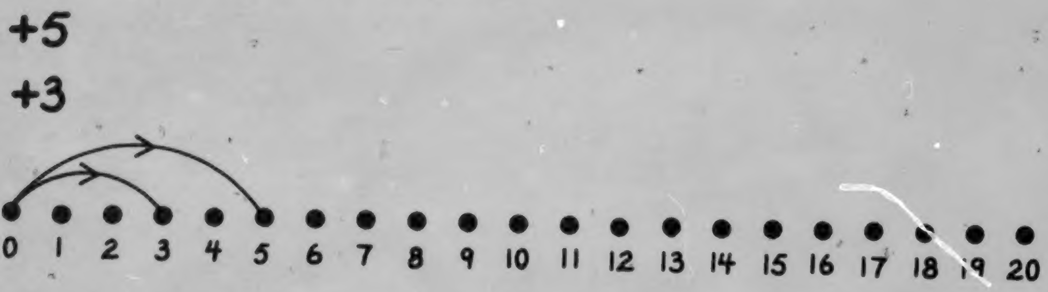
T: The big frog hops five pads at a time; let's show this in red.

Ask the class to count with you as you begin at "0" and point to each dot, up to "5". Then, draw a red arrow for the big frog's first hop.



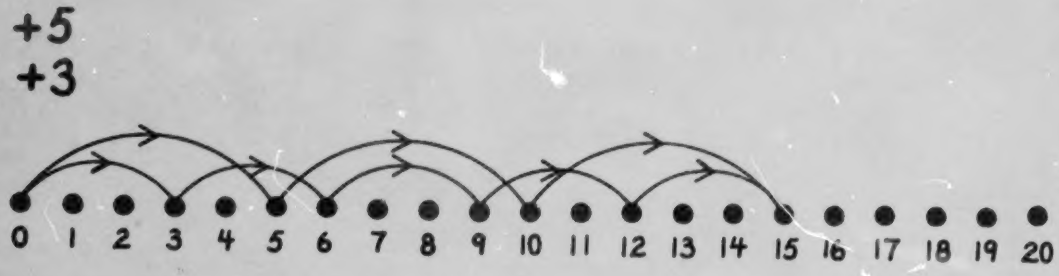
T: The little frog hops three pads at a time; we can show this in blue.

Start at "0" and point to "1", "2" and "3" in turn as the class counts. Draw a blue arrow for the little frog's first hop.



Call on students to show the frogs' successive jumps by drawing more red and blue arrows. Direct this activity towards trying to find a meeting place for the frogs. For example, the students might first draw another blue arrow (from 3 to 6), then another red arrow (from 5 to 10), then two more blue arrows (from

6 to 9 to 12), then another red arrow (from 10 to 15), and finally another blue blue arrow (from 12 to 15). Continue to ask whether the frogs will find a meeting place.



T: So, both frogs land on lily pad "15" and can have lunch together there.

Compliment any students who predicted this and ask how they discovered this answer. Some students may reply that they did so by counting.

T: Let's suppose that the frogs decide to go even farther out into the pond; on which lily pad will they both land next? Remember, there are more lily pads then those I've drawn here — they keep on going!

If any students answer correctly ("30"), ask for an explanation; otherwise, simply leave this problem unresolved. The students will encounter similar situations later in the year.

S33 Introduction to Even and Odd Numbers #2

CAPSULE LESSON SUMMARY

Ask students whether their house numbers are even or odd. In some cases, use the Minicomputer to help decide this. Draw a picture of part of a street and show even-numbered houses on one side and odd-numbered houses on the other side.

MATERIALS

Teacher: Minicomputer set
Student: Paper; pencil

DESCRIPTION OF LESSON

On the day before you present this lesson, ask the students to find out their street addresses. For students who forget, you could:

- have a telephone book on hand and show the students their family names and addresses;
- look in your records for their addresses;
- give hypothetical addresses for the students to use.

In many suburban communities the house numbers are quite large; if the house numbers of your students are 10,000 or larger, you will need more than four Minicomputer boards for this lesson. In this case, borrow extra Minicomputer boards from another CSMP teacher at your school; or draw the extra Minicomputer boards on the chalkboard.

This may be the first time that students see their street addresses as whole numbers. (218, for example, is frequently read aloud as "two-eighteen"; 1,021 is read as "ten-twenty-one.") Point out that these are only abbreviated names and give the full names yourself; that is, "two-eighteen" is a short way of saying "two hundred eighteen."

T: Who knows his or her house number?

Ask a volunteer to write his or her house number on the board and to put it on the Minicomputer.

T: Is this an even number or an odd number?
How do you know?

One possible explanation is that even numbers can be put on the Minicomputer without a checker on the 1-square, whereas odd numbers cannot. If necessary, remind the students of this fact.

If the first student you call on has an even (odd) house number is, ask next for someone with an odd (even) house number to write it on the board and then to put it on the Minicomputer. If you wish, continue this activity for one or two additional house numbers.

Write the words "EVEN" and "ODD" on the board. Tell the students to write their house numbers on their papers and to write whichever word describes their particular house number. Circulate among the students to check their work. Those who need help should be told to put their house numbers on the Minicomputer and to check the 1-square before deciding whether the number is even or odd.

T: Who has an even house number?

Ask several students with even numbers to tell their numbers to the class. Ask several students with odd numbers to do the same.

T: Is anyone unsure about whether their house number is even or odd?

Students who are still undecided should put their house numbers on the Minicomputer, so the class can help them determine whether their numbers are even or odd.

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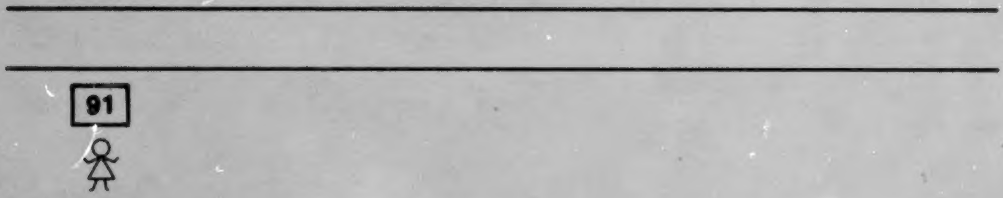
T: In most cities and towns, the houses with even numbers are on one side of the street and those with odd numbers are on the other side. On your way home today, look at the house numbers on your street; you'll see the even numbers on one side and the odd numbers on the other side.

I know a girl named Marie who lives on Kookamonga Street. Her address is 91 Kookamonga. Let's show Marie's house on Kookamonga Street.

Tell the students to copy this picture, as you draw it on the board.



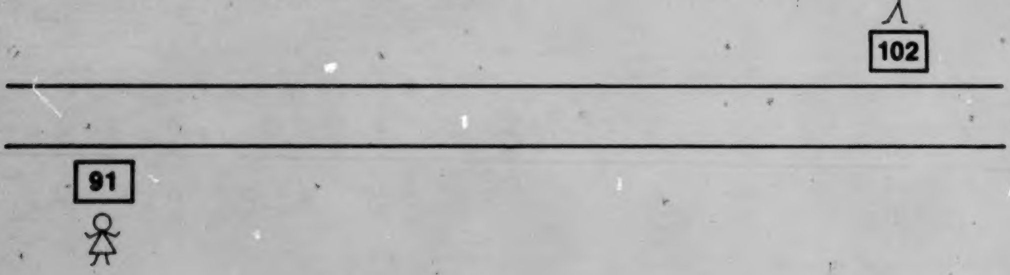
T: What do you suppose these two long, parallel lines are for?

S: Kookamonga Street?

T: Yes. Marie's friend, Edward, also lives on Kookamonga Street. Edward's address is 102 Kookamonga Street. Does Marie have to cross the street when she goes to visit Edward? (Yes) How do you know?

S: 91 is an odd number and 102 is an even number. The odd numbers are on one side of the street and the even numbers are on the other.

T: Let's show Edward's house.



T: Marie and Edward often play catch with a dog who lives on Kookamonga Street. The dog's name is Duke so Marie and Edward call him "Kookamonga Duke". Kookamonga Duke lives at 97 Kookamonga.

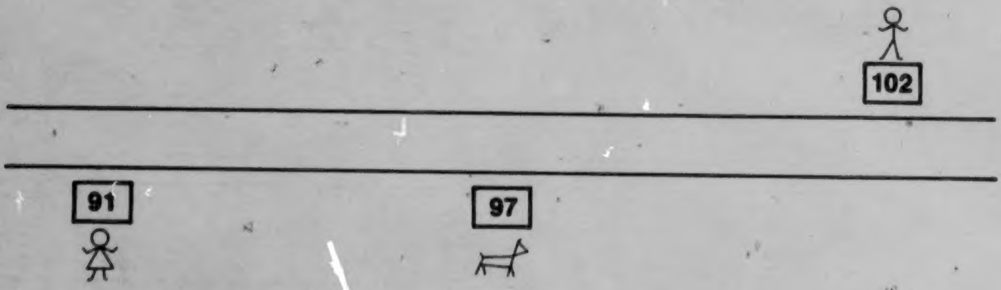
Does Marie have to cross the street when she goes to visit Kookamonga Duke? (No) How do you know?

S: Both Marie and Duke have house numbers which are odd; so they both live on the same side of the street.

T: Does Edward have to cross the street when he goes to visit Kookamonga Duke? (Yes) How do you know?

S: Edward's house number is even and Duke's is odd. They live on opposite sides of the street.

T: Let's draw Kookamonga Duke's house. Who would like to show us where Kookamonga Duke's house should be?



T: There are a number of houses between Marie's house and Duke's house. Could someone draw one of these houses?

Ask the volunteer to draw one of the houses between Marie's house and Duke's house.

T: What might be the number of this house?

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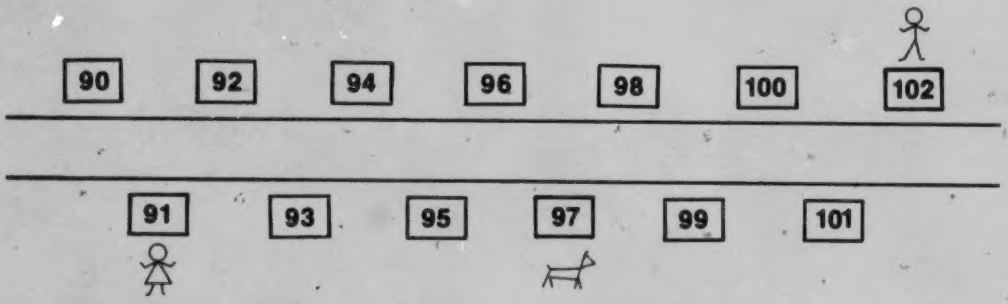
The number of any house between Marie's and Duke's must be an odd number between 91 and 97, so it could be 93 or 95. Record the answer on the board.

T: There are other houses on the same side of the street as Duke's house, and there are other houses across the street from Marie and Duke. Draw as many of these houses as you can and put the numbers on them.

Encourage students who finish quickly to continue their drawings of Kookamonga Street, adding some house numbers more than 102 and some less than 91. Invite students who have correctly drawn these houses to each put one of them in the drawing on the board. Continue for as long as you feel is appropriate. (It is not necessary to include in your drawing all of the house numbers between 91 and 102.)



S34.1 Addition Story #1

CAPSULE LESSON SUMMARY

Decide if a group of first graders have enough money to buy a kickball after earning money from sales of three types of things. Do the addition on the Minicomputer and compare the sum to the cost of the kickball.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

T: In a school near here, the first grade class needed some money to buy a kickball. They brought candy, cookies, and popcorn balls from home to sell for a penny a piece. The class collected 127 pennies from candy sales, 275 pennies from the cookies, and 146 pennies from the popcorn balls.

Write these three amounts on the board.

$$127 \quad 275 \quad 146$$

T: How can we find out how much money they collected in all?

S: Add the three numbers together.

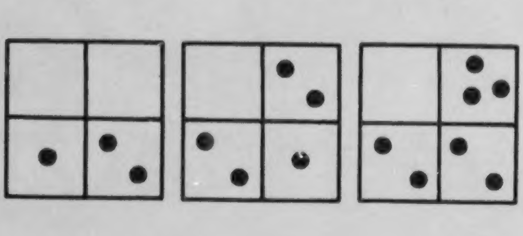
$$127 + 275 + 146 =$$

T: The students needed 400 pennies to buy the kickball. Do you think they had enough?

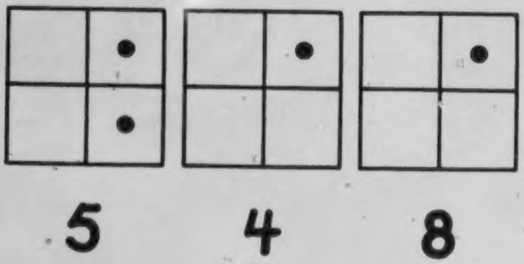
Allow the class to discuss this question. Some students may reason that the sum must be more than 400, since you are adding two numbers which are greater than 100 (127 and 146) to one number which is greater than 200 (275). However, do not expect or insist on a well-phrased explanation.

T: Let's discover exactly how much money was collected.

Ask volunteers to put 127, 275, and 146 on the Minicomputer . . .



. . . to make plays, and to write the answer under the Minicomputer.



Finally, complete your number story on the board.

$$127 + 275 + 146 = 548$$

T: How many pennies are there in a dollar? (100) These students have 548 pennies. How many dollars and cents do they have? (5 dollars and 48 cents) Who can write "5 dollars and 48 cents" as you would see it in the stores?

Select a volunteer to do so.

$5.48

T: The kickball cost $4.00. Did the students have enough money to buy it?

S: Yes.

T: Did they have any money left over? If so, how much?

S: Yes, $1.48.

If the students find this last question difficult, do not insist that they answer it.

S34.2 Eli's Magic Peanuts #2

CAPSULE LESSON SUMMARY

Review what happens when magic peanuts and regular peanuts meet. Write the corresponding number stories involving the addition of positive numbers and negative numbers.

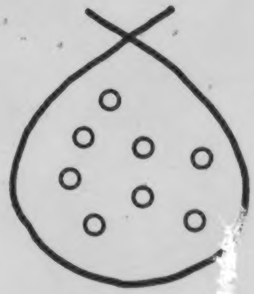
MATERIALS

Teacher: None
Student: Worksheet S34.2

DESCRIPTION OF LESSON

T: Who remembers Eli the Elephant and his magic peanuts?

Invite a student to describe magic peanuts and how they work. Then, draw this picture on the board.

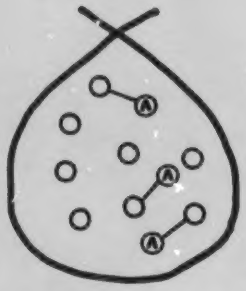


T: Here is Eli's bag of peanuts. How many regular peanuts are in it? (Eight) Eli still doesn't know that some of the peanuts in the jungle are magic. He just picked three magic peanuts and is about to put them in his bag. What will happen?

S: They will make three regular peanuts disappear.

S: Only five peanuts will be left.

Draw the three magic peanuts and call on students to pair them with any three regular peanuts.



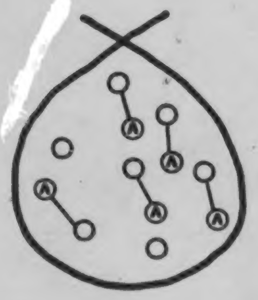
T: Eight regular peanuts plus three magic peanuts is . . . ?

S: Five regular peanuts.

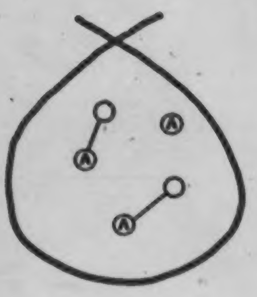
Write a number story for this on the board.

$$8+\hat{3}=5$$

Repeat this activity for the following two situations.



$$7+\hat{5}=2$$



$$\hat{3}+2=\hat{1}$$

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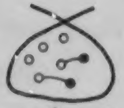
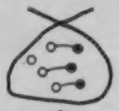
Distribute Worksheet S34.2 and tell the students to complete the number story for each of Eli's bags of peanuts. Students who finish quickly should make up some of their own problems. On a seperate sheet of paper, have the students draw Eli's bag, showing any number of regular and magic peanuts they choose; and ask them to write the appropriate number stories for their drawings.

Name ______________________ S 34.2

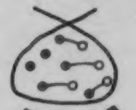
Complete the number stories.



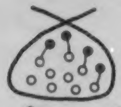
$5 + \hat{2} = \underline{3}$



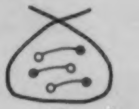
$4 + \hat{3} = \underline{1}$



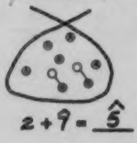
$\hat{6} + 4 = \underline{\hat{2}}$



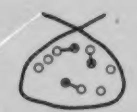
$\hat{4} + 9 = \underline{5}$



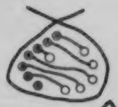
$3 + \hat{3} = \underline{0}$



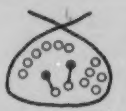
$2 + \hat{7} = \underline{\hat{5}}$



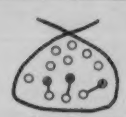
$7 + \hat{3} = \underline{4}$



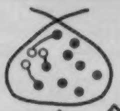
$\hat{7} + 6 = \underline{\hat{1}}$



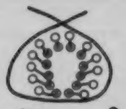
$13 + \hat{2} = \underline{11}$



$\hat{3} + 10 = \underline{7}$



$3 + \hat{9} = \underline{\hat{6}}$



$\hat{12} + 12 = \underline{0}$

S 35

S35.1 Doubling and Halving #1

CAPSULE LESSON SUMMARY

Begin with some mental arithmetic practice involving doubling and halving. Draw 2 x and $\frac{1}{2}$ x arrows between labeled dots.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

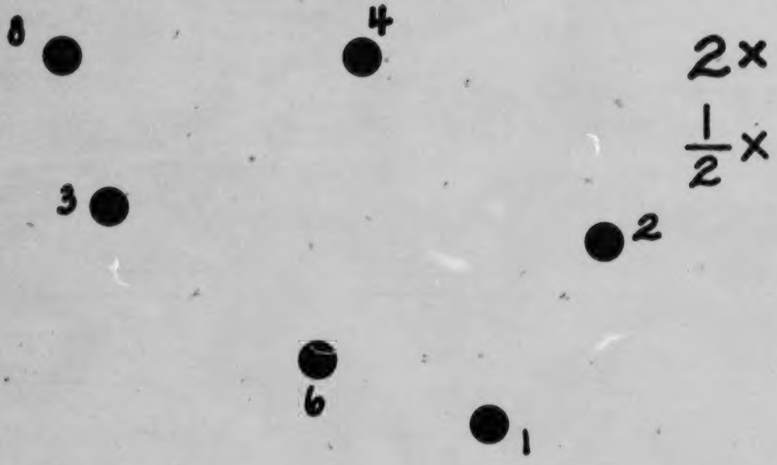
Begin this lesson with about five minutes of mental arithmetic activity similar to that described below. Try to involve many students by varying the difficulty of the questions you pose. Keep this activity moving briskly. If a student cannot answer or answers incorrectly, ask another student to respond. A sample dialogue follows.

T:	What number is 4 + 4?	S:	8.
	What number is 2 x 4?	S:	8.
	What number is $\frac{1}{2}$ x 8[*]?	S:	4.
	What number is 40 + 40?	S:	80.
	What number is 2 x 40?	S:	80.
	What number is $\frac{1}{2}$ x 80?	S:	40.
	What number is 2 x 5?	S:	10.
	What number is $\frac{1}{2}$ x 10?	S:	5.
	What number is 2 x 50?	S:	100.
	What number is $\frac{1}{2}$ x 100?	S:	50.
	What number is 2 x 3?	S:	6.
	What number is $\frac{1}{2}$ x 6?	S:	3.
	What number is 2 x 30?	S:	60.
	What number is $\frac{1}{2}$ x 60?	S:	30.

---

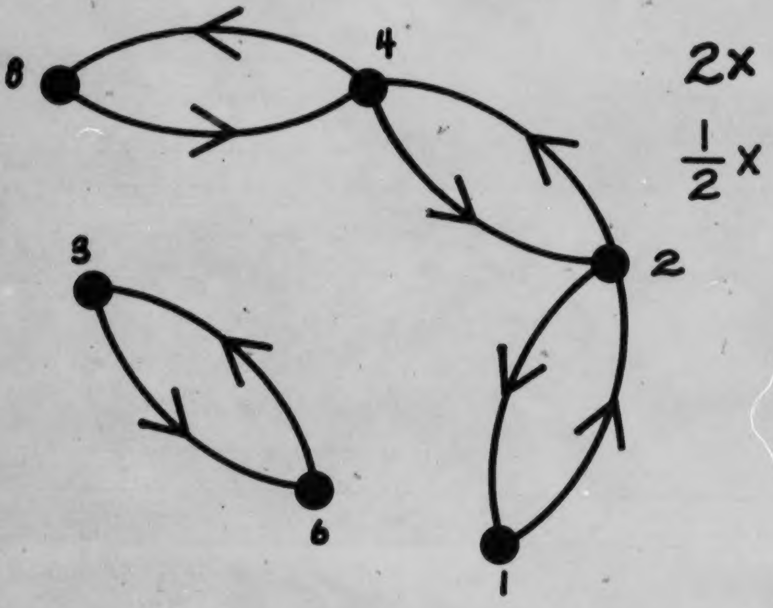
[*] Read "$\frac{1}{2}$ x 8" as "one-half of eight".

Draw this picture on the board.



T: We are going to draw red arrows for 2 x and blue arrows for $\frac{1}{2}$ x. Does anyone see where we can draw an arrow in our picture?

Invite several volunteers to draw arrows in the picture on the board. Occasionally ask the students how they know a red (or blue) arrow may be drawn in a particular place. You may wish to write some of the corresponding stories on the board or have students write them. Continue until the arrow picture is complete.



S35.2 "A Parade of Problems #2"

CAPSULE LESSON SUMMARY

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on.

MATERIALS

Teacher: None

Student: "Parade of Problems #2" workbook; colored pencils

DESCRIPTION OF LESSON

NOTE: This is the second lesson using the "Parade of Problems #2" workbook. The first was Lesson S25.2.

Distribute the students' copies of "Parade of Problems #2". Instruct students to begin by correcting or completing those pages indicated by you on the workbook cover. Demonstrate this by discussing your checking method and turning to a page which requires corrections or completion.

When students have finished correcting or completing pages, they should continue working on the workbook for the remainder of the period.

Collect and check the workbooks.[#] This is the last time this particular workbook is scheduled, but at a later time you may want to have students work on pages which require corrections. If so, be aware that not all students should be required to complete the workbook. As mentioned earlier, the difficulty of the problems increases and students who are pushed beyond their ability may become frustrated.

On the average, about two-thirds of your class should complete through page 10 of the workbook; about one-third should complete through page 20; and a few students may finish the booklet completely.

[#] The answer key for this workbook follows Lesson S25.2 (see pp.143-150).

S36.1. Estimation and an Addition Problem #2

CAPSULE LESSON SUMMARY

Estimate how many beans are in a jar. Take the beans out in handfuls; count and record the number of beans in each handful. Use the Minicomputer to do the resulting addition problem. Decide which estimates were closest to the actual number of beans.

MATERIALS

Teacher: Transparent jar (containing 150-200 dried beans, dried peas, beads, or something similar); Minicomputer set

Student: Small strip of paper

DESCRIPTION OF LESSON

NOTE: This lesson is a virtual repetition of Lesson S11, Estimation and Addition Problem #1, except that the number being estimated in this lesson is larger. Please refer to Lesson S11 (pp. 65-66) for a complete description of the lesson.

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S36.2 Booker's Bakery

CAPSULE LESSON SUMMARY

Use a story about sharing cakes and cookies to discuss dividing a shape into two pieces of exactly the same size. Use the symmetry of a shape to find several ways of dividing it in half. Examine the shapes of the numerals 0 to 9 to determine which of them can be easily cut into two pieces of the same size.

MATERIALS

Teacher:	Posters #1 and #2 for First Grade, Part II; ruler or meterstick; tape
Student:	None

NOTE: On Poster #1 there are three geometrical shapes which should be cut out before class begins.

DESCRIPTION OF LESSON

T: A friend of mine, Mr. Booker, owns a bakery. What kinds of things are sold in a bakery?

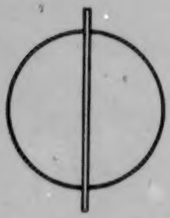
Allow some time for a brief discussion of this question.

T: One of Mr. Booker's finest and most delicious cakes is his chocolate fudge cake. The chocolate fudge cake looks like this.

Tape the demonstration circle (which you previously cut from FG-II Poster #1) to the chalkboard.

T: This chocolate fudge cake is so filling that many people do not want to buy a whole cake. One day, a man came into the store and asked to buy one half of a chocolate fudge cake. Who would like to pretend this ruler (hold up the ruler) is a knife and show us how to cut the cake in half?

Choose a student to place the ruler on edge against the figure, to show it being cut in half. Provide help if necessary.



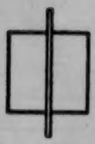
T: How many pieces of cake are there now?

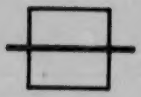
S: Two.

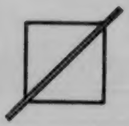
T: Do they both seem to be the same size?

S: Yes.

Tell the class a second story about a pineapple upside-down cake, taping the demonstration square to the board and following the procedure described earlier. This square-shaped cake may be cut in half in many ways; for example,



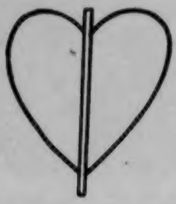




T: For Valentine's Day, Mr. Booker bakes a special cake. What do you think this cake looks like?

S: It's shaped like a heart.

Tape the heart-shaped figure to the chalkboard and choose a volunteer to show how to cut it in half.



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T: How many pieces of cake are there? (Two)
Do they both seem to be the same size? (Yes)

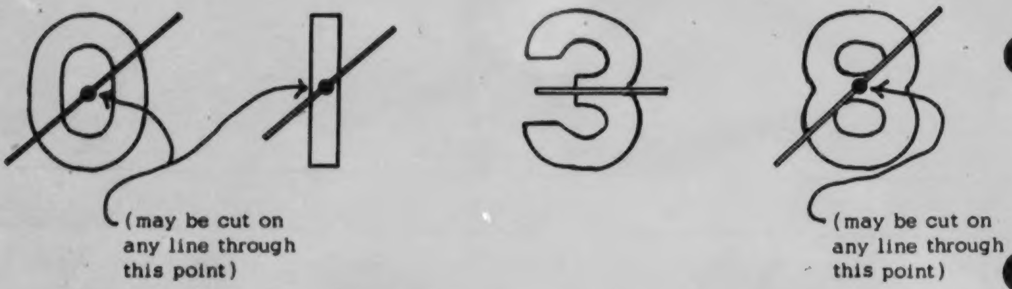
If the class suggests cutting the cake in some other way, proceed as follows.

T: How many pieces of cake are there? (Two)
Yes; but when we cut the cake this way, it's not very easy to see whether or not both pieces are really the same size. Does anyone know a different way to cut the cake, so that it will be easier to check that both pieces are the same size?

When someone suggests cutting the cake as shown on the preceding page, continue.

T: A pair of twins lives on Mr. Booker's street. For the twins' birthday, Mr. Booker baked ten cookies shaped like the numerals from "0" to "9". The twins want to share the cookies, and they decide to cut each of the cookies in half. Sometimes, however, they couldn't be sure that the two pieces of cookie were both the same size.

Tape FG-II Poster #2 (which shows the ten numerals from "0" to "9") to the board and choose volunteers to show how the numerals may be cut into two pieces which appear to be of equal size. Those which may be cut this way are shown below. The other numerals, of course, can also be cut into two equal pieces; but since the two pieces would not have the same shape, the equality of their areas would not be immediately apparent.


(may be cut on any line through this point)
(may be cut on any line through this point)

S37.1 Story Problem #1

CAPSULE LESSON SUMMARY

Draw pictures to help decide how many tires are needed to supply each of seven cars with four new tires.

MATERIALS

Teacher: None.
Student: Paper; colored pens

DESCRIPTION OF LESSON

Distribute sheets of paper to the students and tell this story.

T: A friend of mine works at a service station near here. This morning, seven cars drove into the station. The owner of each car bought four new tires. How many tires, all together, did my friend sell? To help my friend find out how many tires he sold, you can draw any picture you want.

As the students work, it would be best not to provide any guidance, although you may want to repeat the details of the story. Students who finish quickly should be asked to write some number stories about their drawings. After a while, show the class several completed pictures and discuss together how each picture relates to the problem.

On the following page there are several examples of pictures drawn by CSMP students. (In Katie's third number story "22" is mistakenly written instead of "2", but the organization of her picture and her other number stories demonstrate an understanding of the problem and its solution.)

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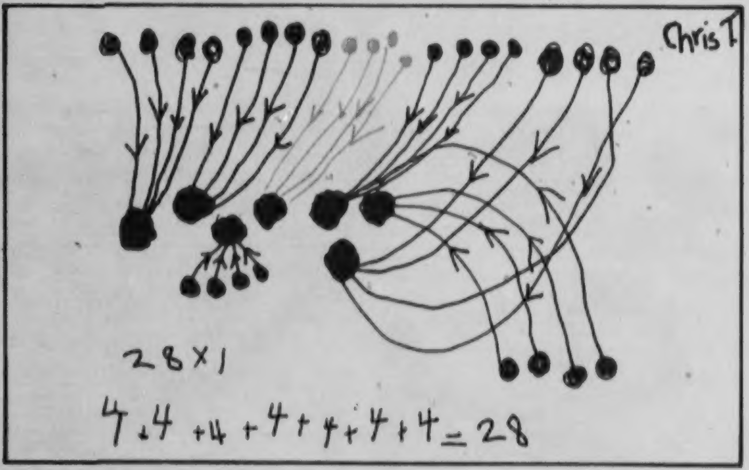
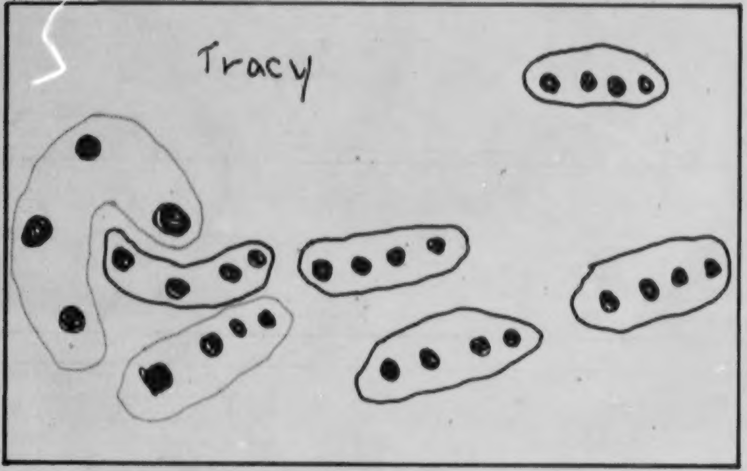
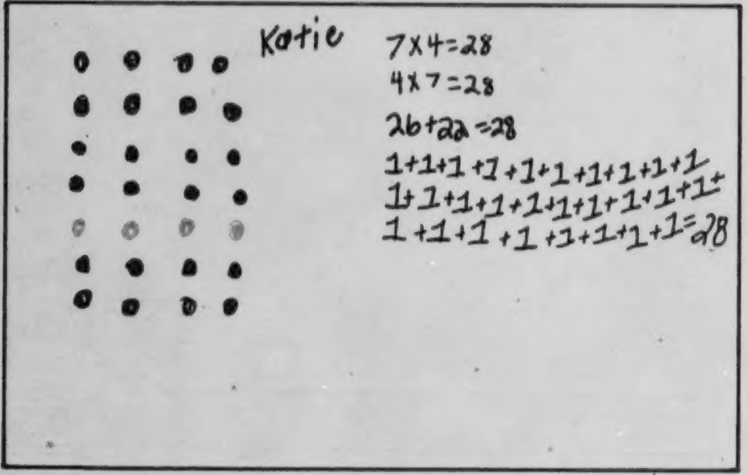

Chris T.
28×1
4+4+4+4+4+4+4=28


Tracy


Katie
7×4=28
4×7=28
26+22=28
1+1+1+1+1+1+1+1+1+1
1+1+1+1+1+1+1+1+1+1+
1+1+1+1+1+1+1+1=28

S37.2 The String Game with Two Strings #1

CAPSULE LESSON SUMMARY

Put the A-block pieces into a two-string picture in which the string labels are given. Play the A-Block String Game.

MATERIALS

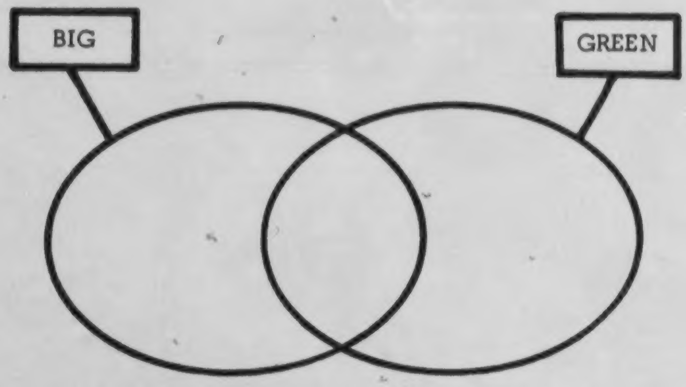
Teacher:	A-Block String Game kit; colored chalk
Student:	None

DESCRIPTION OF LESSON

Before the lesson begins, prepare the team board and divide the class into two teams.*

T: Last time we played the string game we only used one string. Today we will play it with two strings. First, let's practice a little.

Draw and label these two strings.



Call on several students to place A-block pieces until two or three pieces have been placed in each of the four regions. Emphasize that all big, green pieces must be placed where the two strings overlap, and that all small, non-green pieces must be placed outside of both strings.

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* See APPENDIX: The String Game for a complete description of equipment and preparation for the game.

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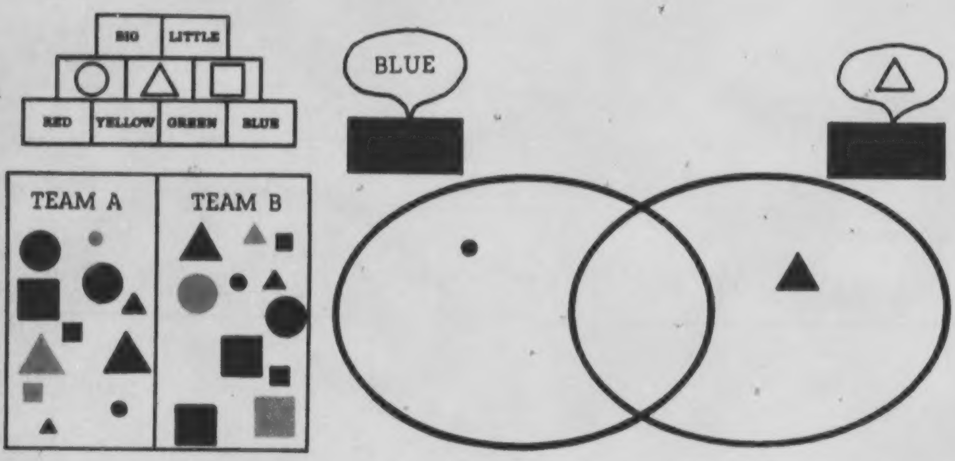
T: Let's begin again but this time, I won't tell you what the strings are for. You must guess where each of the pieces go.

Place the cards $\boxed{\text{BLUE}}$ and $\boxed{\triangle}$ face down as shown below. (The "balloons" indicate what is hidden on the cards.) Take one A-block piece from each team's collection and place them properly in the picture. This provides two starting clues for the students.



T: The white cards could be for any of these labels (point to the list of possible labels above the team board). Let's read them together.

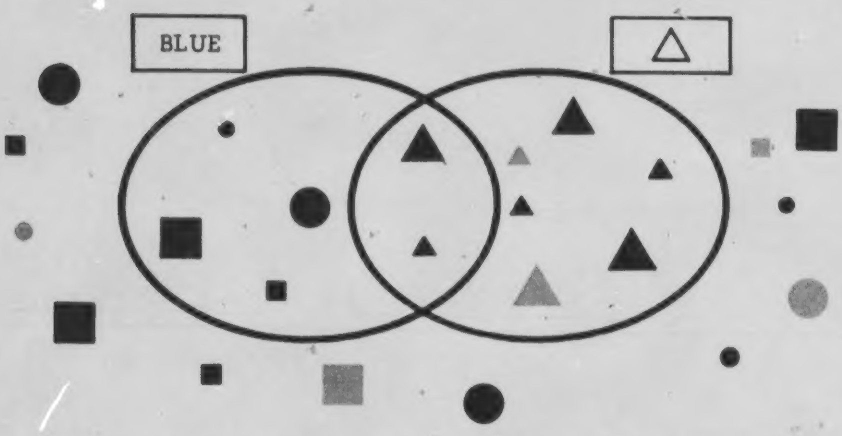
When you have done so, continue.

T: I have one new rule for the game this time: When it is your turn and you place a piece correctly, you may have an extra turn and try a second piece. After two pieces, though, it is the other team's turn, even if you are correct both times.

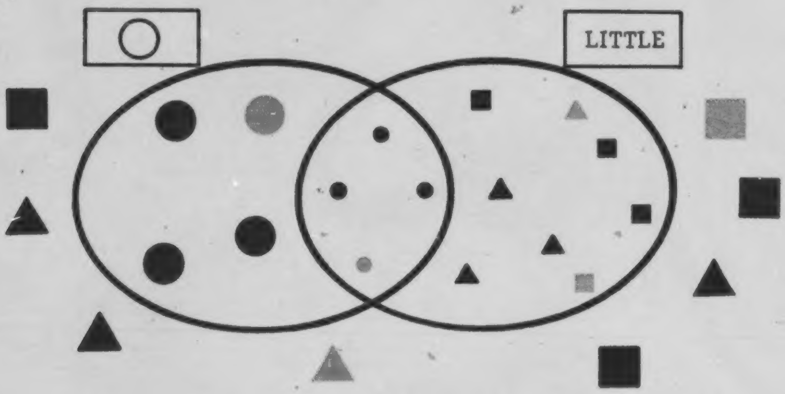
The other rules are the same. When one team has placed all of its pieces correctly, the last player can say what the strings are for and can win. You must give correct labels for both strings in order to win. Otherwise, we continue with the other team's turn.

T: No one should talk during the game; students who talk will cause their team to lose a turn.

If a piece is correctly placed, say "yes" and allow the piece to remain in the picture (and allow the student to have a second turn); if the piece is placed incorrectly, say "no", and return it to the team board. To assist you in the judging, the correct placement of all pieces is shown below.



If your class enjoys this game and some time remains, play a second game using $\boxed{\bigcirc}$ and $\boxed{\text{LITTLE}}$ for the face-down cards. Again place two pieces, such as a large circle and a small triangle, as starting clues. The correct placement for all of the pieces is shown below.



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S38.1 Coin Problem #2

CAPSULE LESSON SUMMARY

Using three clues, discover how much money is in a container.

MATERIALS

Teacher: Two dimes and two nickels; a small opaque container
Student: None

DESCRIPTION OF LESSON

Before the lesson begins, put two dimes and two nickels into a small opaque container, chosen so that the coins inside are not visible, but may be heard clearly when the container is shaken.

T: Today you will all be detectives. You must discover what coins are in this container.

Hold up the container, shake it, and ask several students to shake it, also.

T: What coins could be in this container?

S: Three dimes?

T: There could be three dimes in this container. Three dimes make how many cents?

S: 30¢.

T: Yes; who else has a guess about the money in this container?

S: 27¢.

T: What coins could make 27¢?

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Accept any correct combination of coins. Try to keep this part of the lesson moving briskly. When a specific combination of coins is suggested, ask how many cents it would make. When a certain amount of money is suggested, ask which coins could make that much money. (Do not record these suggestions on the board.)

T: How much money could there be if all the coins were dimes? (10¢, 20¢, 30¢, . . . , etc.)

S: 70¢.

T: How many dimes do we need to make 70¢?

S: Seven.

T (holding up one finger): Each finger is for one dime. How many cents are in one dime?

S: 10¢.

T (holding up a second finger): How many cents are there in two dimes?

S: 20¢.

Continue to hold up another finger and to count by ten, until you reach 70.

T: How many fingers am I holding up?

S: Seven.

T: So seven dimes make how many cents?

S: 70¢.

Repeat this procedure by supposing first, that all of the coins are nickels and next, that all of the coins are pennies.

First clue

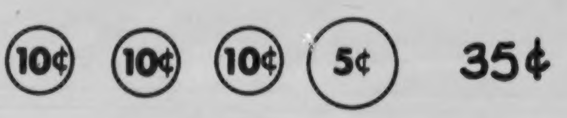
T: Here is a clue: there are only dimes and nickels in this container. Each coin is either a dime or a nickel.

Accept some new suggestions for the container's contents. If a combination of coins is suggested, ask how much money it makes; if an amount of money is suggested, ask which coins could make that much money. Proceed quickly to the next clue.

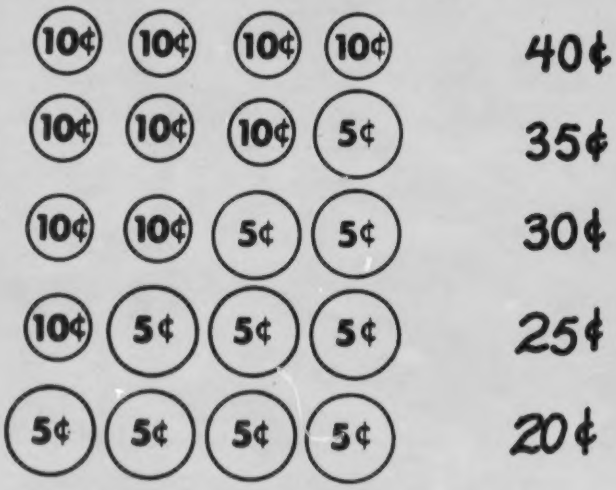
Second clue

T: There are exactly four coins in this container. Remember that each coin is either a nickel or a dime. What could be in this container?

Accept several suggestions, recording each possibility on the board. If a student suggests three dimes and one nickel, for example, record the suggestion as follows.



Continue until your list of possibilities is complete as shown below. (If necessary, suggest one of the possibilities yourself.)



T: What is the smallest amount of money that I could have in this container?

S: 20¢.

T: What is the largest amount of money that I could have in this container?

S: 40¢.

Third clue

T: Here is the last clue, so listen carefully: There are exactly as many dimes in this container as there are nickels. When you know how much money is in this container, you may whisper it to me.

Accept several whispers. (It may be necessary to repeat this last clue.) Ask a student to answer aloud (30¢) and then reveal the coins in your container to the class.

S38.2 A Subtraction Arrow Picture

CAPSULE LESSON SUMMARY

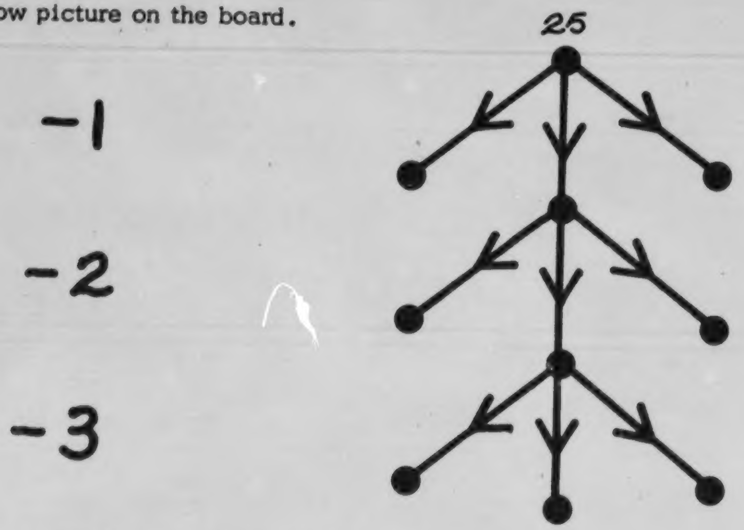
Ask where the largest number and the smallest number are in an arrow picture which has three types of subtraction arrows. Label the dots and then look for missing arrows.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

Draw this arrow picture on the board.

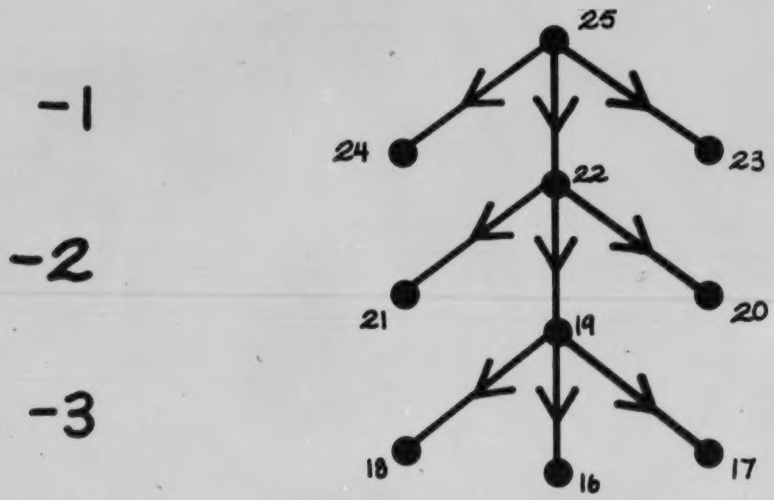


T: Where is the largest number in this arrow picture?

Perhaps no one will be able to answer this question (the top-most dot, labeled "25"); it should challenge even your brightest students. However, simply posing the question is a useful way to help focus the students' attention on the problem. (25 is the largest number in the picture because all subtraction arrows point away from 25.)

T: Where is the smallest number in this arrow picture?

Compliment any student who realizes that the lowest dot in the center of the picture is for the smallest number. One at a time, invite students to label dots in the arrow picture; the first few should be asked how they know a dot is for a particular number. Continue in this way until all the dots are labeled. NOTE: You may wish to refer occasionally to the classroom number line or 0-109 Numeral Chart to demonstrate one or more of the calculations.



T: What is the largest number in this arrow picture?

S: 25.

T: What is the smallest number in the picture?

S: 16.

T: Who can trace another arrow in this arrow picture without drawing any more dots?

Invite sutdents to trace new arrows and, each time, ask for the appropriate number story. For example, suppose a student traces an arrow from 24 to 22.

S: 24 minus 2 is 22.
This would be a green arrow.

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If none of the students can suggest a new arrow, trace one yourself and ask the class what the arrow could be for. Continue this activity for several minutes, but do not expect your class to find all of the missing arrows.

S39.1 Length #2

CAPSULE LESSON SUMMARY

In meters, measure the length of the chalkboard and other items in your room. Measure one of those items using the length of an eraser as the unit. Then compare the two measurements.

MATERIALS

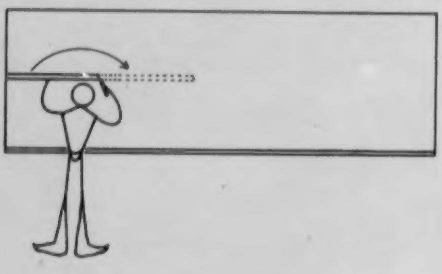
Teacher: Meter stick
Student: None

DESCRIPTION OF LESSON

Hold up a meter stick for the class to see.

T: This is a meter stick; it is one meter long. How long, in meters, do you think our chalkboard is?

Accept estimates of the chalkboard's length and then, measure it with the meter stick. Ask a student volunteer to help you in the measurement process as you demonstrate it to the class. Place the meter stick on the board, let the student make a mark at the end of the meter stick, and advance the stick one meter.



Continue until you reach the end of the chalkboard.

If the length of your chalkboard is other than a whole number of meters (for instance, 4 meters 26 centimeters), students may well suggest that its length is $4\frac{1}{2}$ meters. Take time to discuss whether the length is exactly $4\frac{1}{2}$ meters, concluding that the measurement is simply "between 4 and 5 meters" or "more than 4 meters."

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Repeat this activity to measure other items in the room: the coat closet door; your desk; a child's height or your height; the width of the room itself; etc.

Before concluding this lesson, select a second object shorter than the meter stick with which to measure. For example, you might choose a chalkboard eraser. Use this object to conduct the activity described below, substituting your actual measurements for those given here.

T: Now let's measure my desk using this eraser instead of the meter stick. My desk measured two meters long (hold up the meter stick). How many erasers long do you think it is; more than two erasers long, or less than two erasers?

The class should agree that it is more than two erasers long. Let some students predict the length in erasers and then measure your desk with the eraser.

T: My desk is certainly more than two erasers long. How were we sure, even before we measured?

S: Since the eraser is shorter than the meter stick, it takes more of them to go across the desk.

Do not be concerned if none of the students is able to verbalize this explanation.

S39.2 Number Friends #2

CAPSULE LESSON SUMMARY

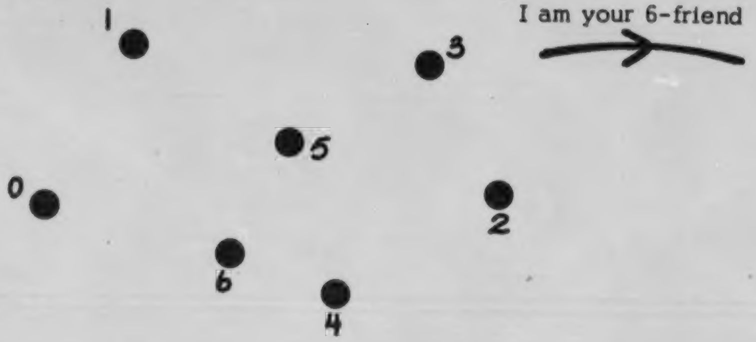
Draw arrows for "I am your 6-friend" between labeled dots. (Two numbers are "6-friends" if and only if their sum is 6.)

MATERIALS

Teacher: Colored chalk
Student: Colored pens; Worksheets S39.2* and **

DESCRIPTION OF LESSON

Draw this picture on the board.



T: Who remembers what 6-friends are?

S: 6-friends are numbers that add up to 6.

T: Where can we draw an arrow in our picture for "I am your 6-friend"?

Call on students to draw arrows, asking each time for the appropriate "explanation"; for example,

S: I drew an arrow from 1 to 5, because 1 + 5 = 6.

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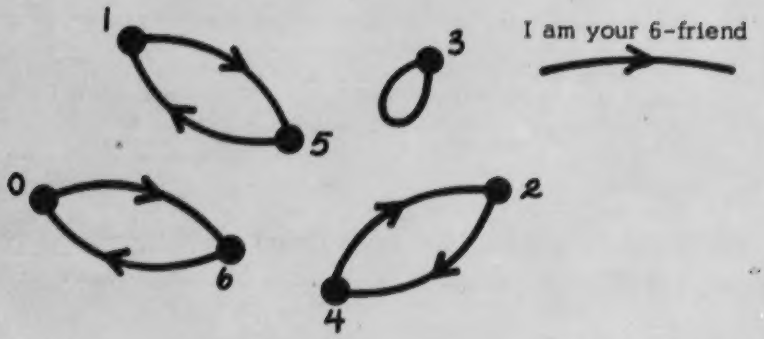
For your reference, the completed picture is shown below.



If no one suggests drawing a loop at 3, draw the students' attention to this part of the picture.

T: 3 plus what number is 6?

S: 3.

T: How can we show in the picture that 3 is its own 6-friend?

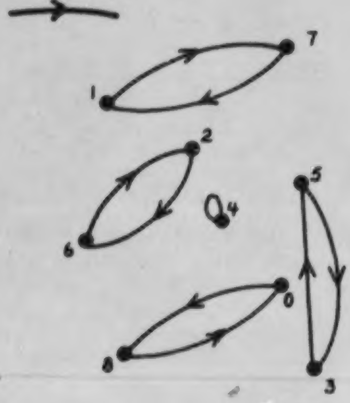
S: Draw a loop at the dot for 3.

Distribute Worksheet S39.2*. Explain that the students should draw "I am your 8-friend" arrows on the front side and "I am your 10-friend" arrows on the reverse. Students who complete the one-star worksheet should be given the two-star worksheet.

Name ____________________ S 39.2 *

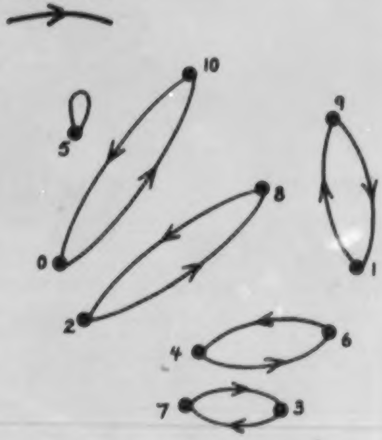
Draw all the missing red arrows.

I am your 8-friend



Draw all the missing blue arrows.

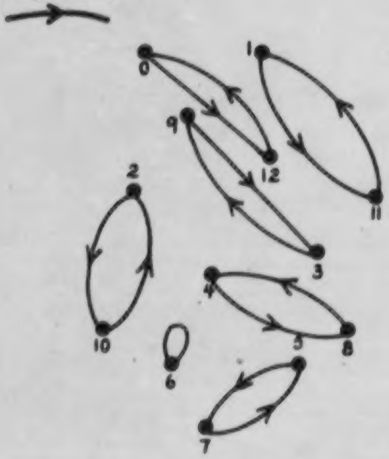
I am your 10-friend



Name ____________________ S 39.2 **

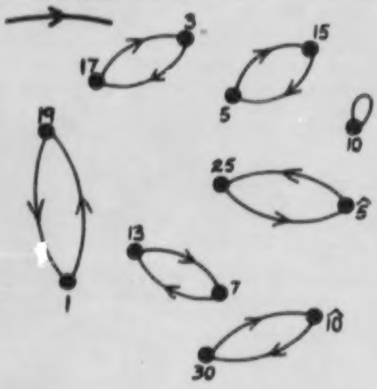
Draw all the missing red arrows.

I am your 12-friend



Draw and label your own dots. Then draw all the missing blue arrows.

I am your 20-friend



Many solutions are possible.

S40 Adjustment Day #4

NOTE: See page 16, Section One NOTES TO THE TEACHER in CSMP Mathematics for the First Grade, Part I for a full explanation of the purpose of scheduled adjustment days.

If work is proceeding on schedule, you may wish to repeat a previous lesson, either for a small group of students or for the entire class. Often the basic content of a particular lesson can be made to appear completely different by adjusting a story line and/or the numbers in the story. Consider the needs of your class in choosing lessons to repeat.

This might be a good time to try another variation of the String Game, choosing either the two-string version or the three-string version, according to the readiness of your particular class.

If you omitted the worksheets from any previous lesson, you may wish to distribute them on this day, after an appropriate warm-up activity. Also, if you believe some of your students can work further in "A Parade of Problems #2", you may want to allow extra time for individual work.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with S41.1 Combinatorics with Three Digits #1.

EARLY WARNING!

Among the next nine classroom lessons are some which require extra preparation time, or which make use of materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the needed materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more than once during the nine-day period.)

S43.1 Length #3: a ten-foot piece of string; a ball of string; scissors

S49.1 The String Game with Two Strings #2: (The team board and game board must be prepared before the lesson begins.)

S 41

S41.1 Combinatorics with Three Digits #1

CAPSULE LESSON SUMMARY

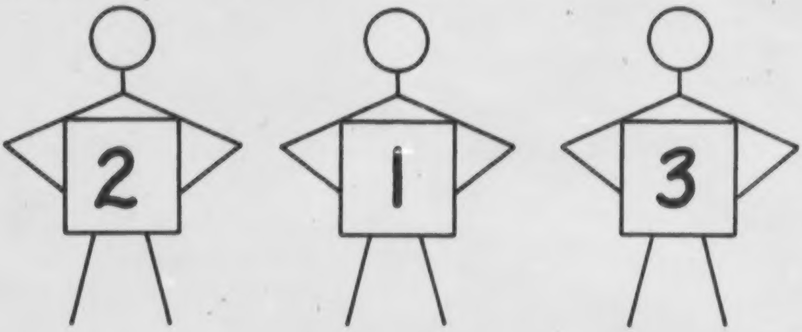
Using three numeral cards as a visual aid, discover the six possible three-digit numbers which have 1, 2, and 3 as digits. Draw an arrow picture in which the dots are for those six numbers and the arrows are for "I am more than you".

MATERIALS

Teacher: Demonstration Numeral Card set; colored chalk
Student: None

DESCRIPTION OF LESSON

From the demonstration Numeral Cards set, display the "1", "2", and "3" cards. Choose three students to come to the front of the room, giving each of them a card. Ask them to stand close together, facing the class and holding up their numeral cards. The order in which the students stand is not important at this moment; for example,



T: We are showing a number with these numeral cards. What number is it?

S: 213.

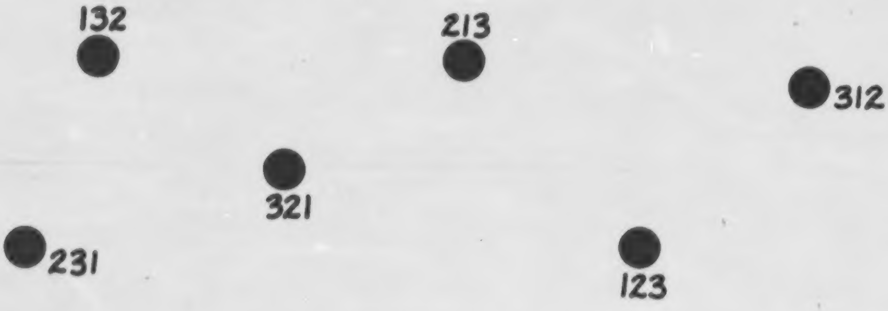
T: Who would like to draw and label a dot for 213 on the board?

T: What is another number we could make with these numeral cards?

Accept a suggestion and tell the students holding the numeral cards to move to new positions to show this number. (Do not explicitly tell them where to stand; if necessary, call on a fourth child to place them in the correct positions.)

T: What number do you see now? Who would like to draw and label a dot for this number on the board?

Continue in this way until dots for all six possible numbers are drawn and labeled on the board. Supply any numbers that your students miss.



T: Which of these six numbers is the largest?

S: 321.

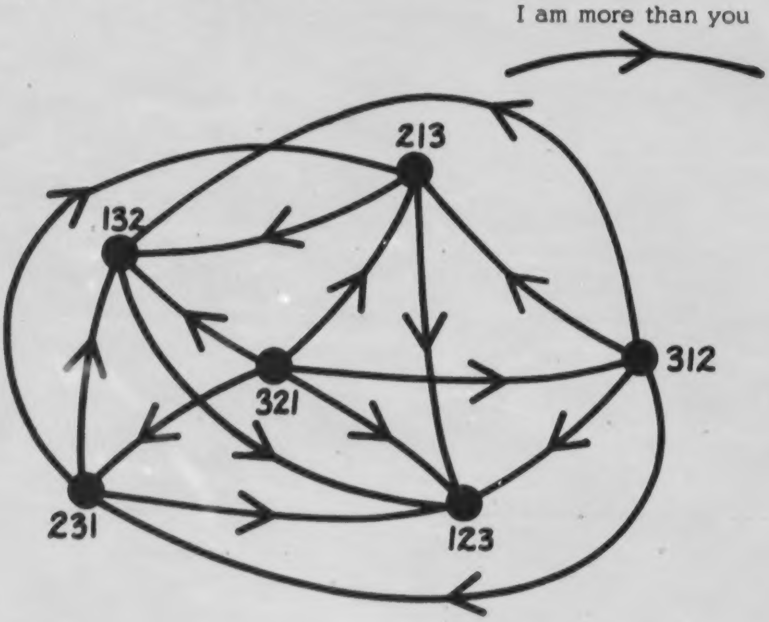
T: Which number is next to the largest? (312)
Which number is the smallest? (123)
Which number is next to the smallest? (132)

On the board near the dot picture, draw a red key arrow for "I am more than you".

T: With red arrows, these numbers are saying, "I am more than you". Who can draw a red arrow in our picture?

S 41

Send volunteers to the board to draw arrows, each time asking for the appropriate number story. Continue for as long as you feel is appropriate, but do not expect the students to find all possible arrows. For your information, the completed arrow picture is shown below.



S41.2 Composition of Functions #2

CAPSULE LESSON SUMMARY

Label the dots in an arrow picture which has - 3 and + 1 arrows. Ask where - 2 arrows can be drawn. Notice number patterns in the picture.

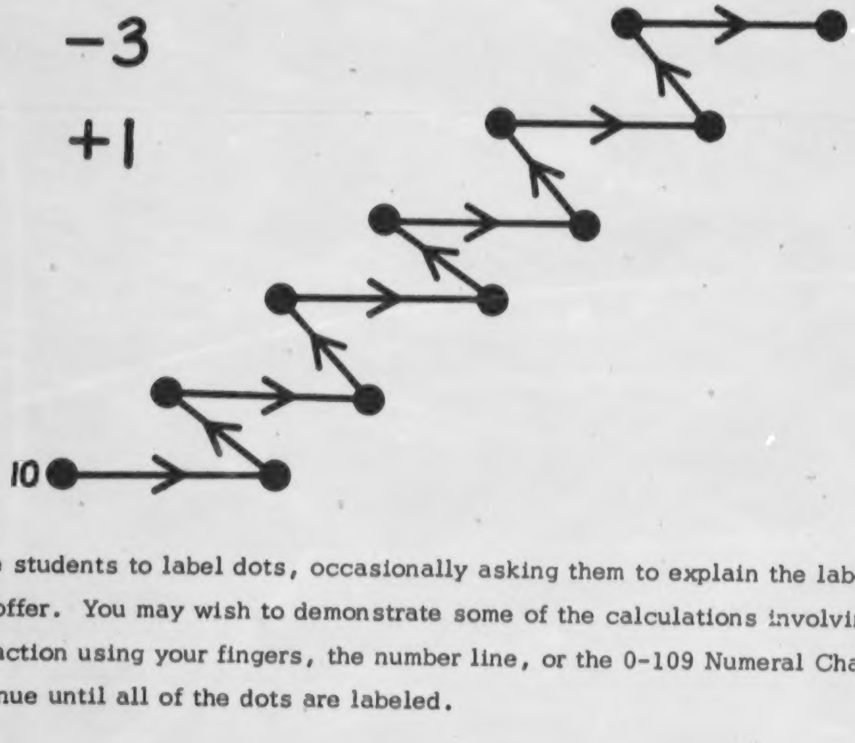
MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



Invite students to label dots, occasionally asking them to explain the labels they offer. You may wish to demonstrate some of the calculations involving subtraction using your fingers, the number line, or the 0-109 Numeral Chart. Continue until all of the dots are labeled.

In green, write "- 2" near the arrow picture.

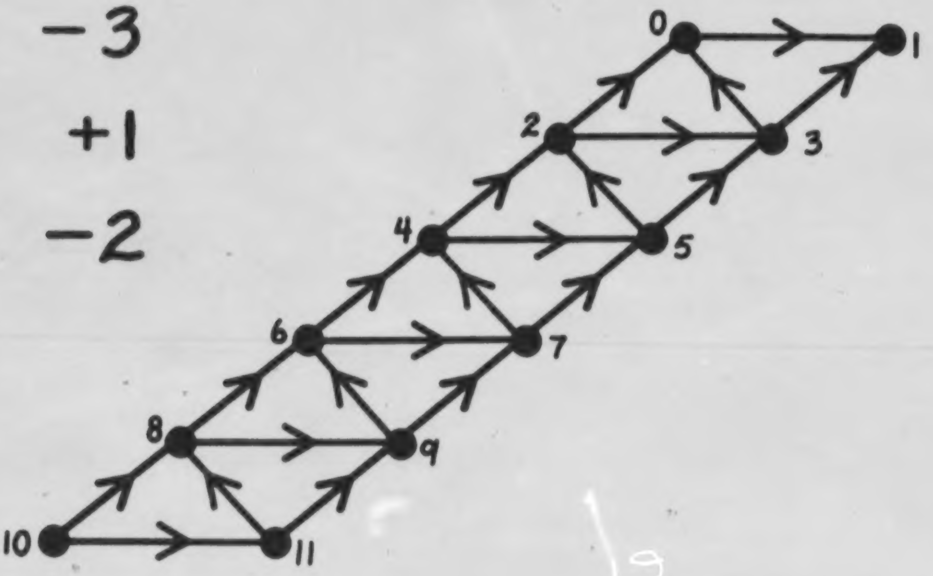
T: Where could we draw a - 2 arrow in this arrow picture?

250

S 41

Ask a student to trace a - 2 arrow; if it is correct, draw it yourself. Continue this activity until the class finds all the - 2 arrows. Occasionally, ask students to explain how they know they may draw a - 2 arrow between two particular dots.

For your information, the completed arrow picture is shown below.



Point to the dots along the right side of the arrow picture (the dots for 1, 3, 5, etc.).

T: What do you notice about these numbers?

S: They get larger by two.

S: They are all odd numbers.

Point to the dots on the left side of the arrow picture (the dots for 0, 2, 4, etc.).

T: What do you notice about these numbers?

S: They are all even.

S: They get larger by two also.

S 42

S42 Subtraction Problem #4

CAPSULE LESSON SUMMARY

Present a subtraction problem in a story situation and solve the problem on the Minicomputer. Do some sequences of problems on the Minicomputer.

MATERIALS

Teacher: Minicomputer set
Student: Minicomputer set; Worksheets S42*, and ** and ***

DESCRIPTION OF LESSON

Exercise 1

Tell the following story or one similar to it. Choose one of your students to be the "star" of this story.

T: Bruce went to the grocery store last night for his father. His father gave him a $20 bill to pay for the groceries, but the groceries cost only $12. How much money did Bruce get back to bring home to his father?

Allow the students to estimate the answer, recording some of their predictions on the board.

T: What calculation could we do to solve this problem?

S: "20 - 12".

Let a student write this problem on the board.

$$20 - 12 = \qquad\qquad \begin{array}{r} 20 \\ -12 \\ \hline \end{array}$$

Display three Minicomputer boards.

T: How can we calculate "20 - 12" on the Minicomputer?

S: Put 20 on the Minicomputer and then take away 12.

Call on a student to put 20 on the Minicomputer.

T: Can we take away 12 now?

S: No; we need to make some backward plays first.

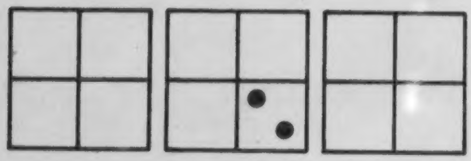
T: Yes; where would the checkers for 12 be? Show me.

S: On the 10-square and the 2-square.

T: Does anyone see a play to help us get checkers on the 10-square and 2-square?

S: "20 = 10 + 10".

Let a volunteer make this play, and then push one of the two checkers into a corner of the 10-square.



$20 - 12 =$ $\begin{array}{r} 20 \\ -12 \\ \hline \end{array}$

T: That play helped us; we have a checker on the 10-square. We still need a checker on the 2-square. Does anyone see a play which will help us?

S: "10 = 8 + 2".

T: We now have checkers on the 10-square and 2-square, so we're ready to take away 12.

Send a volunteer to take 12 away from the number on the Minicomputer. Ask someone else to complete the number stories on the board.

Erase the board and remove the checkers from the Minicomputer before continuing.

Exercise 2

Distribute some checkers and an individual Minicomputer sheet (each containing two Minicomputer boards) to each student.

T: Put 17 on your Minicomputers.

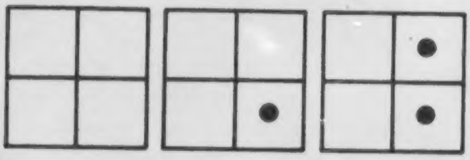
Check the students' Minicomputers and choose a volunteer to put 17 on the demonstration Minicomputer. Write the following problem on the board.

$$17 - 2 =$$

T: Take away 2 from the number on your Minicomputers.
What number is 17 - 2?

S: 15.

Ask a student to take away 2 from the number on the demonstration Minicomputer and to complete the number story at the board. Write a new problem on the board directly below the previous one.



$$17 - 2 = 15$$
$$15 - 10 =$$

T: You have 15 on your Minicomputers; take away 10.
What number is 15 - 10?

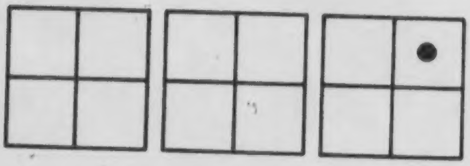
S: 5.

Ask a student to take away 10 from the number on the demonstration Minicomputer and to complete the number story. Then, write a third problem on the board: "5 - 1 =".

T: What number is 5 - 1?

S: 4.

Ask a student to take away 1 from the number on the demonstration Minicomputer and to complete the number story. Write a final problem on the board.



17 − 2 = 15
15 − 10 = 5
5 − 1 = 4
4 − 4 =

T: Take away 4 from the number on your Minicomputer.
What number is on your Minicomputer now?

S: 0.

Ask a student to take away 4 from the number on the demonstration Minicomputer and to complete the number story.

Repeat this exercise with the following sequences of problems. (None of the calculations require backward plays.)

S 42

Put 36 on all Minicomputers.

36 - 4 =
32 - 10 =
22 - 2 =
20 - 20 =

Put 79 on all Minicomputers.

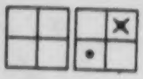
79 - 9 =
70 - 30 =
40 - 0 =
40 - 40 =

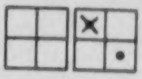
Exercise 3

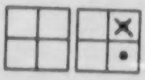
Worksheets S42*, **, and *** are available for the remainder of the period; allow approximately ten minutes for individual work. Explain to the students that they are to complete the number stories and that the illustrated Minicomputers are provided for the students' benefit. Students who have difficulty with these subtraction problems should be encouraged to "take away" the appropriate checkers by crossing them out.

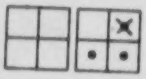
Name ____________ S 42 *

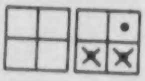
Complete the number stories.

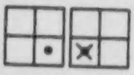

6 - 4 = 2

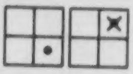

9 - 8 = 1

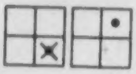

5 - 4 = 1

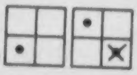

7 - 4 = 3

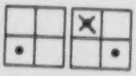

7 - 3 = 4

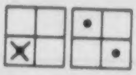

12 - 2 = 10


14 - 4 = 10


14 - 10 = 4

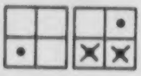

29 - 1 = 28

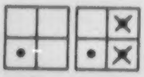

29 - 8 = 21

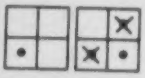

29 - 20 = 9

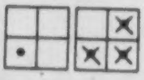
Name ____________ S 42 **

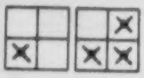
Complete the number stories.

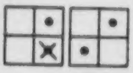

27 - 3 = 24

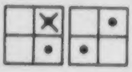

27 - 5 = 22

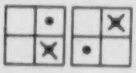

27 - 6 = 21

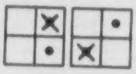

27 - 7 = 20

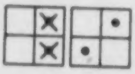

27 - 27 = 0

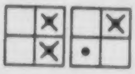

56 - 10 = 46


56 - 40 = 16


56 - 14 = 42

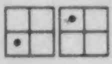

56 - 42 = 14

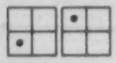

56 - 50 = 6

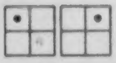

56 - 54 = 2

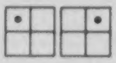
Name ____________ S 42 ***

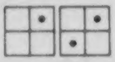
Complete the number stories.

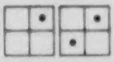

28 − 4 = 24

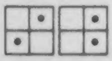

28 − 10 = 18

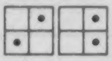

84 − 40 = 44

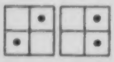

84 − 2 = 82

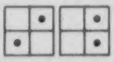

46 − 20 = 26

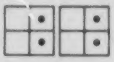

46 − 24 = 22

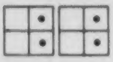

65 − 22 = 43


65 − 14 = 51


65 − 51 = 14


65 − 43 = 22


55 − 33 = 22


55 − 48 = 7

S43.1 Length #3

CAPSULE LESSON SUMMARY

Unravel a ball of string and decide where to cut the string so that the resulting piece will be half as long as another given piece. Divide eight students into two groups so that half of the students are in each group. Discuss the result, write a corresponding number story, and draw an appropriate arrow picture.

MATERIALS

Teacher:	A ten-foot piece of string; a ball of string; scissors; colored chalk
Student:	None

DESCRIPTION OF LESSON

Choose two volunteers to stretch a ten-foot piece of string out in front of the class. In the sample dialogue which follows, substitute the name of two students in your class.

T: I want to cut a piece from this ball of string which is exactly one half as long as the piece Susan and James are holding. How might I do that?

Allow the class to discuss the problem. Most suggestions will probably involve estimating the middle of the ten-foot string. Most students will agree, however, that by only estimating the middle, one cannot be sure that the two halves of the string are the same length. Someone should eventually suggest folding the ten-foot string in half and measuring the new length of string from the folded string (as illustrated on the next page).

When the students agree that this process will work, carry it out and then unfold the first string to check this method.

S 43

①

②

③

Ask the two students to be seated and call eight new volunteers to the front of the room.

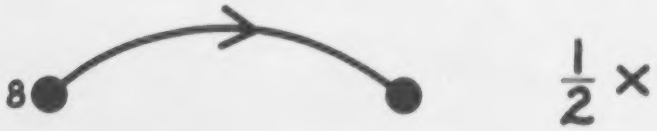
T: When I say "go", one half of you should move over to the door, and one half of you should go to the window . . . Go!

After several moments, four students should be at the door and four should be at the window. Any other arrangement should cause the class to protest, and the eight students to redistribute themselves.

T: We began with eight students. One half of them moved to the door. What number story can we write about this?

S: $\frac{1}{2} \times 8 = 4$ (read: "one half of eight equals four").

Write this number story on the board and next to it, draw this arrow picture.



T (pointing to the dot at the right): What number goes here?

S: 4.

Label the dot "4".

T: What number is 4 + 4? (8)
What number is 2 x 4? (8)
What number is $\frac{1}{2}$ x 8? (4)

Repeat these three questions for the following numbers.

5 + 5	6 + 6	10 + 10
2 x 5	2 x 6	2 x 10
$\frac{1}{2}$ x 10	$\frac{1}{2}$ x 12	$\frac{1}{2}$ x 20

S 43

S43.2 1/2 x and 2 x Arrows

CAPSULE LESSON SUMMARY

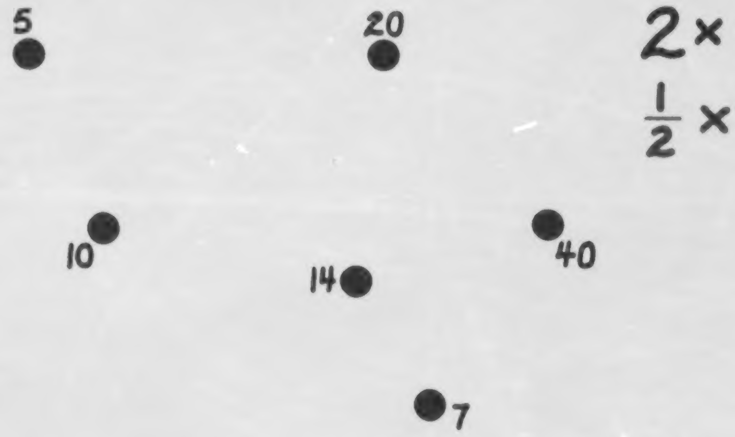
Draw 2 x and $\frac{1}{2}$ x arrows between labeled dots. Record the corresponding number stories.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

Draw this picture on the board.



T: We would like to draw red arrows for 2 x and blue arrows for $\frac{1}{2}$ x (read: "one-half of"). Who can draw an arrow in the picture for us?

Call on students to draw arrows, checking the correctness of each arrow as it is drawn. Suppose, for example, that a student draws a red arrow from 10 to 20.

T (tracing the arrow): 2 x 10 = 20. Is that correct?

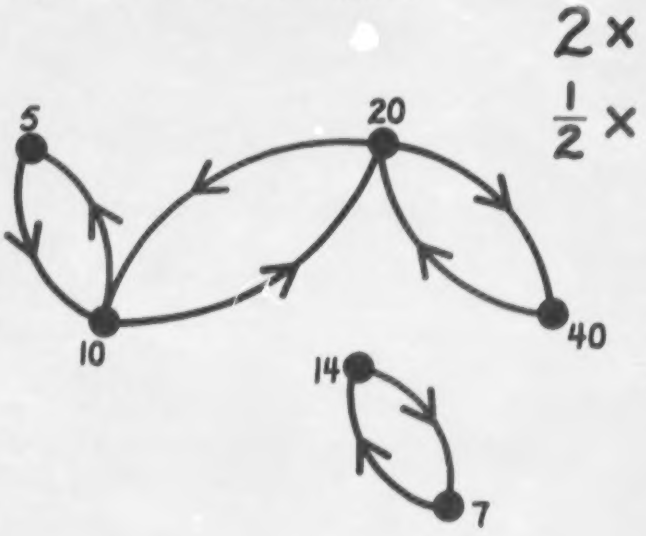
If any students think not, remind them that "2 x 10" means "10 + 10". This will serve to check correct answers and expose incorrect answers. When someone draws a blue $\frac{1}{2}$x arrow, for instance from 40 to 20, check it by tracing the arrow and asking, "Is $\frac{1}{2}$ x 40 = 20?" If there is disagreement, rephrase the question as, "Does 2 x 20 = 40?" or as "Is 20 + 20 = 40?"

As each arrow is drawn, write the corresponding number story beside the picture. You may want to use this opportunity to introduce the notion of "return" arrows. For example, if a red 2x arrow has been drawn from 5 to 10, then a blue return arrow (for $\frac{1}{2}$x) may be drawn from 10 back to 5. (Of course, if the blue $\frac{1}{2}$ x arrow is drawn first, then a red return arrow may be drawn.) Bear in mind that it is the notion of "return arrow" which is important here --- not the term itself, nor the technique of drawing one.

For your information, the completed picture is shown below.

$2 \times 20 = 40$
$\frac{1}{2} \times 40 = 20$
$2 \times 7 = 14$
$\frac{1}{2} \times 14 = 7$

$2 \times 5 = 10$
$\frac{1}{2} \times 10 = 5$
$2 \times 10 = 20$
$\frac{1}{2} \times 20 = 10$



S 44

S44.1 Three Strings #2

CAPSULE LESSON SUMMARY

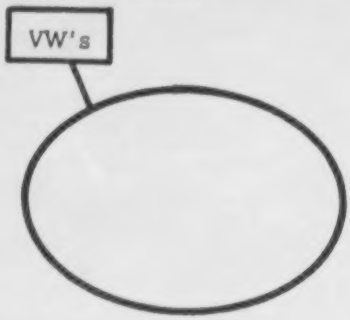
Draw a three-string picture in which one string is for Volkswagens, one string is for green cars, and one string is for cars with radios. Describe cars in terms of whether or not they have these characteristics and put dots for them in the picture.

MATERIALS

Teacher: Colored chalk
Student: None

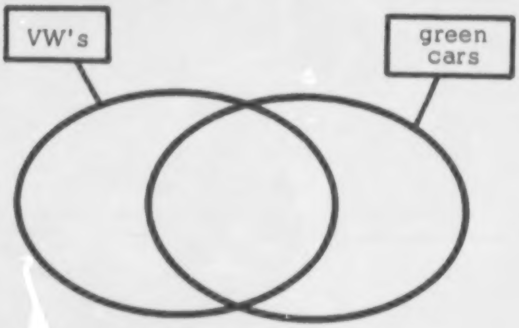
DESCRIPTION OF LESSON

Draw this string picture on the board.

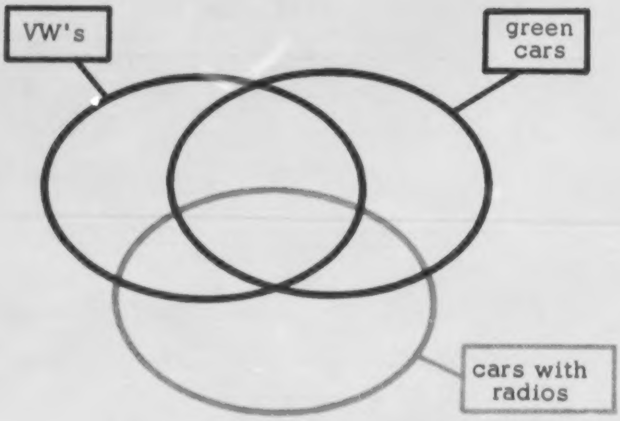


T: This blue string is for all the Volkswagens in the United States. Who can draw a red string for all the green cars in the United States?

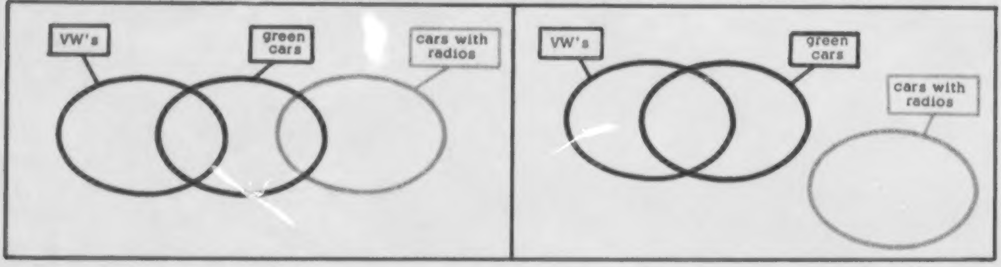
By now, the students have had quite a bit of experience with two-string pictures and should be able to add the second string with no difficulty. (If the strings are drawn with no overlap, ask someone to draw a dot for a green Volkswagen. This question should lead to a correct drawing.)



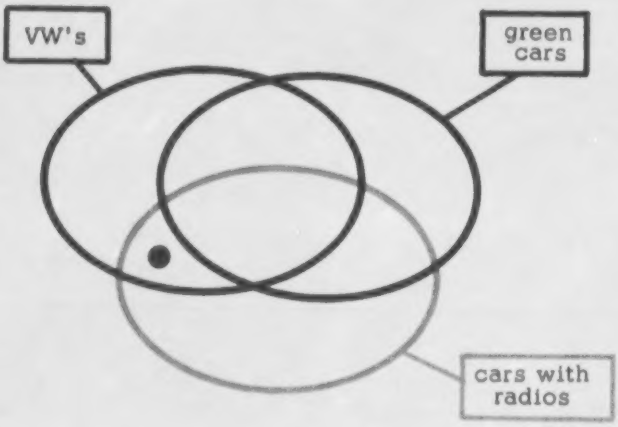
T: Who can draw a yellow string for all the cars in the United States that have radios?



The two most common errors made in drawing a third string are shown below. In either case, ask someone to draw a dot for a green Volkswagen with a radio; the question should lead to the correct placement of the third string.



When the strings have been properly drawn, draw a dot in some region of the drawing and ask a student what the dot could be for; for example,



S 44

S: It's a VW which is not green, but has a radio.

Repeat this activity several times, placing a dot in other regions, before continuing.

T: Now, I'm thinking of a certain car; I want you to draw a dot for it. You may ask me questions about the car, but I can only answer "yes" or "no."

There are three useful questions: "Is it a VW?"; "Is it green?"; and "Does it have a radio?" As each of these questions is asked answer it, commenting that the question is a good one. When other questions are asked, answer without further comment. When the students have enough information to locate the car you have in mind, ask a volunteer to draw a dot for it in the string picture.

Repeat this activity for several other cars chosen either by you or by some of the students (who would then answer the class's questions).

S44.2 Subtraction and a +1 Arrow Picture

CAPSULE LESSON SUMMARY

Label the dots in a +1 arrow road and then draw -4 arrows between numbers already in the picture.

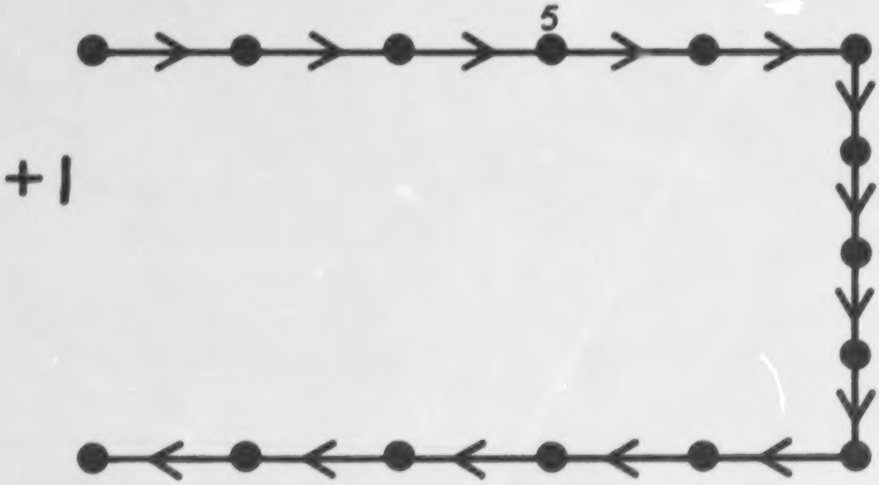
MATERIALS

Teacher: Colored chalk

Student: Worksheet S44.2; colored pencils

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



T: The red arrows are for +1. Who can label a dot?

Call on students until all of the dots have been labeled. Then, write "-4" in blue below the "+1"key.

T: Who can draw a blue -4 arrow?

Call on students to draw -4 arrows. As each arrow is drawn, check it by reading the corresponding number story and counting backward four dots on the arrow road.

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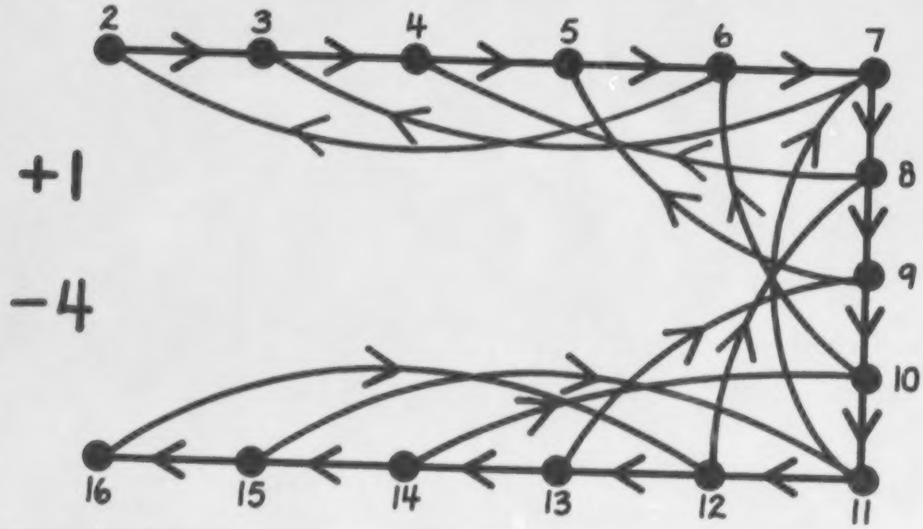
T (tracing a blue arrow from 7 to 3): 7 - 4 = 3. 7 . . . 6, 5, 4, 3 (point to the dot for each of these numbers in turn).

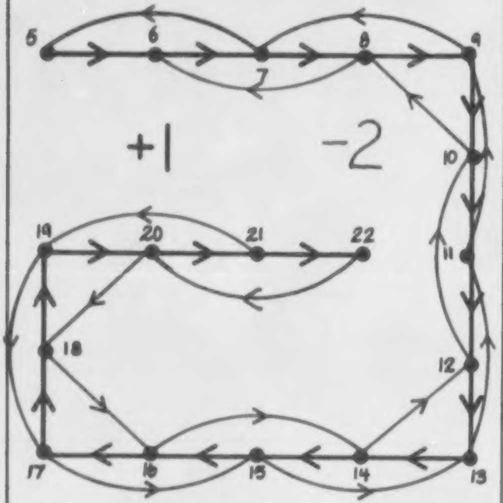
Do not be concerned if the class does not find all possible - 4 arrows. For your information, the completed arrow picture is shown below.



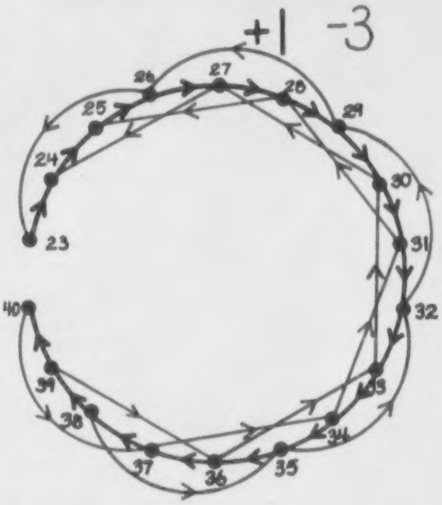
Distribute Worksheet S44.2 to the students and explain that on the front side they should label the dots and draw all of the - 2 arrows, and on the reverse side they should label the dots and draw - 3 arrows.

Name ______________________ **S 44.2**

Label the dots. Draw all the −2 arrows.



Label the dots. Draw all the −3 arrows.



S 45

S45.1 Counting Activity

CAPSULE LESSON SUMMARY

Count by two, starting at 0 and continuing to at least 40.
Count by five, starting at 0 and continuing to at least 100.

MATERIALS

Teacher: 0-109 Numeral Chart
Student: None

DESCRIPTION OF LESSON

Exercise 1

Remind the students about the counting activities you conducted earlier in the school year and about how each of the students counted out one number, in turn.

T: Today we are going to count by twos. We'll begin by counting together as a group and we'll start counting at 0.

As the class counts, point to each numeral on the 0-109 Numeral Chart, counting up to at least 40.

If there are more than 20 students in your class, you should seperate them into two groups for the next activity. Explain the order in which the students should count (i.e., from left to right, from front to back, etc.)

Point to the student who will start counting at 0, and if necessary, point to each student whose turn it is to say a number. Make corrections as necessary. Begin again at 0 with the second group (if there is one) and continue until all of the students have participated in the counting.

Exercise 2

T: Now we are going to count by fives. Let's all count together, starting at 0.

As the students count, point to each numeral on the 0-109 Numeral Chart, continuing up to at least 100. Then, repeat the process described in Exercise 1, having each student count individually. Continue until all of the students have taken a turn.

S45.2 Addition Problem #4

CAPSULE LESSON SUMMARY

Use the Minicomputer to do some mental arithmetic involving addition.

MATERIALS

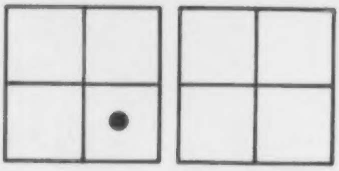
Teacher: Minicomputer set
Student: Worksheets S45.2* and **

DESCRIPTION OF LESSON

Display two demonstration Minicomputer boards.

T: Today we will use the Minicomputer to solve some addition problems.

Put 10 on the Minicomputer.



T: What number is on the Minicomputer? (10)
What number is 10 + 8? Whisper your answer to me. (18)

As you ask this question, point to the checker on the 10-square and pretend to put a checker on the 8-square. Accept several whispers and then ask a student to answer aloud.

S: 18.

Put the checker on the 8-square.

T: Yes; 10 + 8 = 18.

Write this number story on the board and remove the checkers from the Minicomputer. Put a checker on the 2-square.

T: What number is on the Minicomputer? (2)
What number is 2 + 10? (12)

You could again pretend to put a checker on the 10-square. Allow a few students to whisper their answers to you, and then ask a student to answer aloud. Call on a student to add 10 to the number on the Minicomputer and to write the number story "2 + 10 = 12" on the board.

T: What number is on the Minicomputer? (12)
What number is 12 + 20? (32)

Accept a few whispers before sending a student to add 20 to the number on the Minicomputer. Write the number story "12 + 20 = 32" on the board and continue this activity with "32 + 5 = 37".

Begin again by putting 3 on the Minicomputer and repeat the procedure described above for the following number stories.

3 + 4 = 7
7 + 20 = 27
27 + 10 = 37

If your class remains interested, proceed to generate three more number stories starting with 40 on the Minicomputer.

40 + 14 = 54
54 + 21 = 75
75 + 4 = 79

The last calculation ("75 + 4") requires a "4 + 4 = 8" play to get the answer in the standard configuration.

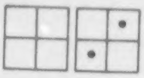
1

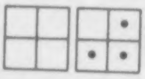
S 45

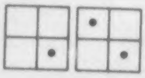
Worksheets 45.2* and ** are available for the remainder of the period. The students should complete the number stories using the illustrated Minicomputers, as needed, for help with the calculations. (On the Minicomputers of the two-star worksheet, no checkers are shown. Students who have difficulty with this worksheet should be encouraged to draw in the checkers.)

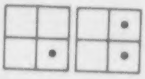
Name ______________________ S 45.2 *

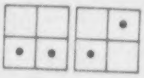
Complete the number stories.

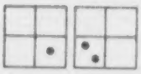

4 + 2 = 6

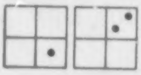

4 + 3 = 7

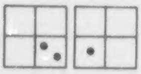

11 + 8 = 19

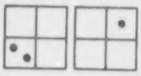

5 + 10 = 15

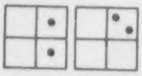

12 + 24 = 36

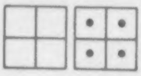

2 + 12 = 14


14 + 4 = 18


12 + 10 = 22


20 + 24 = 44


44 + 14 = 58


7 + 8 = 15

Name ______________________ S 45.2 **

Complete the number stories.

11 + 22 = 33

40 + 13 = 53

10 + 86 = 96

21 + 48 = 69

14 + 31 = 45

24 + 32 = 56

56 + 40 = 96

12 + 13 = 25

15 + 14 = 29

42 + 28 = 70

28 + 23 = 51

S 46

S46.1 Subtraction on the Minicomputer

CAPSULE LESSON SUMMARY

Using the Minicomputer, decide how many pears and how many apples were left in the kitchen after a second grade class took some of them to eat during a walk.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

T: One of our second grade classes was going for a walk and wanted to take along some fruit. There were 54 pears in the kitchen and the second grade class took 28 of them. How many pears were left in the kitchen? What calculation should we solve?

S: "54 - 28".

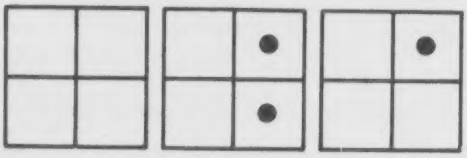
Write this calculation on the board.

T: How many pears were left, do you think? (26)

Accept several guesses and record them on the board.

T: Let's do this calculation on the Minicomputer.

Choose a volunteer to put 54 on the Minicomputer.



54 - 28 =

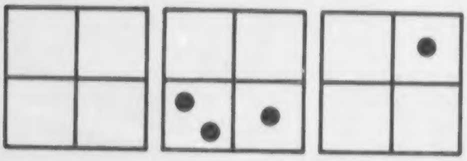
T: Who can take away 28?

S: We need a backward play first.

T: We need a checker on the 20-square. What backward play can we make to get a checker on the 20-square?

S: "40 = 20 + 20".

Ask a volunteer to make the play (using both hands and saying the play aloud).



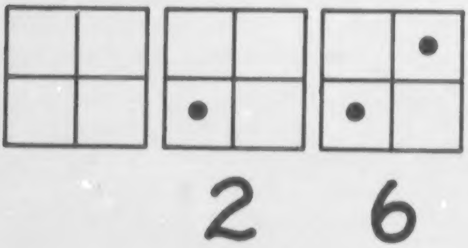
54 − 28 =

T: Now, who can take away 28?

S: We still need a checker on the 8-square.

S: We need a backward play: "10 = 8 + 2".

Invite students to make the backward play, to take away 28, and to write the answer under the Minicomputer boards. Complete the number story on the chalkboard.



54 − 28 = 26

S 46

T: 26 pears were left in the kitchen.

Any students who correctly predicted this result might be asked how they arrived at the answer.

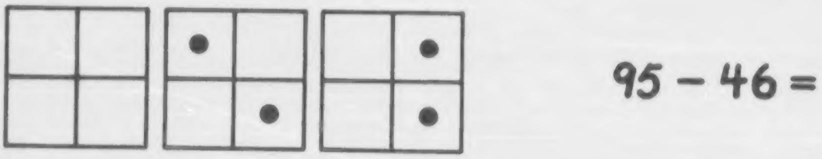
Remove all checkers from the Minicomputer and erase the board before continuing.

T: There were also 95 apples in the kitchen and the second grade class took 46 of them. What calculation should we write to find out how many apples were left in the kitchen?

S: "95 - 46".

Write this calculation next to the Minicomputer.

As before, accept and record several students' predictions. Then, choose a volunteer to put 95 on the Minicomputer.

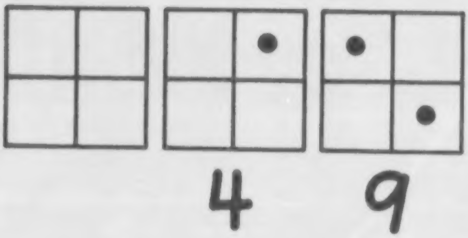


T: Who can take away 46?

S: We need some backward plays first.

Call on students to make the backward plays ("80 = 40 + 40" and "10 = 8 + 2"), and to write the answer under the Minicomputer boards.

Complete the number story on the board.



$95 - 46 = 49$

T: There were 49 apples left in the kitchen.

Again, ask any students who guessed correctly to explain their methods for obtaining the answer.

S46.2 Tangram Puzzles #1

CAPSULE LESSON SUMMARY

Make certain designs with all of the Tangram pieces.

MATERIALS

Teacher: None

Student: Tangram set; Tangram booklet

DESCRIPTION OF LESSON

These are the same Tangram booklets that were used in First Grade, Part I. The students are to cover each picture using all seven Tangram pieces. They may try pictures they were unable to do before or they may repeat some pages that they have done before.

Before beginning the lesson, you may wish to have the students fit the seven Tangram pieces in the square on the front cover, to be sure that none of the pieces are missing.

The Tangram set and Tangram booklets will be used again in Lesson S55. See pages 278-285 of Part I for solutions to the Tangram puzzles.

S47.1 Eli Visits His Grandmother

CAPSULE LESSON SUMMARY

There are three paths Eli can take to his grandmother's house. Draw a map which shows how many peanuts he picks up along each of the three paths. Decide which path Eli takes to arrive with the most peanuts.

MATERIALS

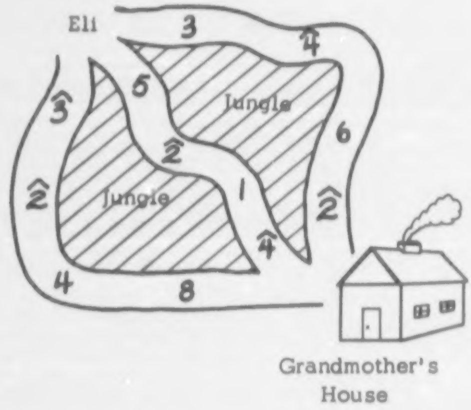
Teacher: None
Student: None

DESCRIPTION OF LESSON

T: Do you remember Eli the Elephant? Well, Eli's grandmother was sick, so Eli decided to visit her. To cheer her up, he planned to bring her a bag of peanuts, plus all of the peanuts he would pick up on the way to her house.

Eli still doesn't know the difference between magic peanuts and regular peanuts, so he might pick up either kind along the way.

Draw this picture on the board.

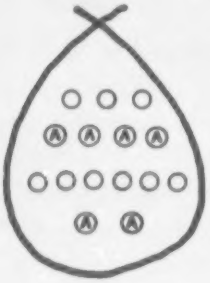


T: There are three paths Eli sometimes takes to his grandmother's house. This picture shows the number of peanuts he picks up and puts in his bag at various places along the path. Which path would Eli take to arrive at his grandmother's house with the most peanuts in his bag?

Allow several minutes for the class to think about and discuss this situation. Then, ask the students to vote for either the upper, middle, or lower path.

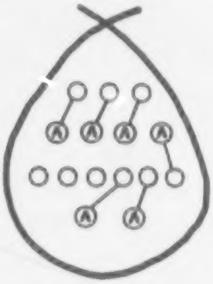
T: Let's see how many peanuts Eli has when he takes the upper path. First, he finds three regular peanuts; then, four magic peanuts; then, six regular peanuts; and finally, two magic peanuts.

As you say each number, draw that many peanuts in Eli's bag and write the appropriate numeral in a calculation on the chalkboard.



$$3+\hat{4}+6+\hat{2}=$$

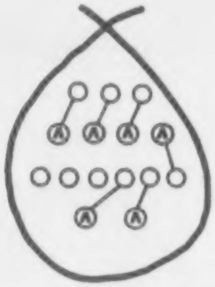
Call on students to pair the magic peanuts with regular peanuts and to complete the number story; for example,



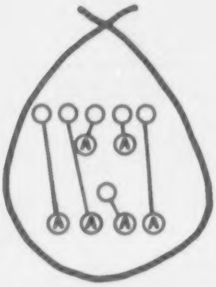
$$3+\hat{4}+6+\hat{2}=3$$

Repeat this procedure to obtain a total number of peanuts for the other two paths.

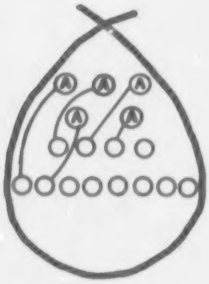
For easy identification, draw the middle path's picture next and the lower path's picture on the bottom.



$$3+\hat{4}+6+\hat{2}=3$$



$$5+\hat{2}+1+\hat{4}=0$$



$$\hat{3}+\hat{2}+4+8=7$$

T: How many peanuts does Eli have when he takes the upper path? (Three)

How many, when he takes the middle path? (Zero)

How many, when he takes the lower path? (Seven)

So, which path would Eli take to arrive at his grandmother's house with the most peanuts?

S: The lower path.

S 47

S47.2 A + 5 Spiral

CAPSULE LESSON SUMMARY

Draw and label dots in a + 5 spiral which begins at 0.

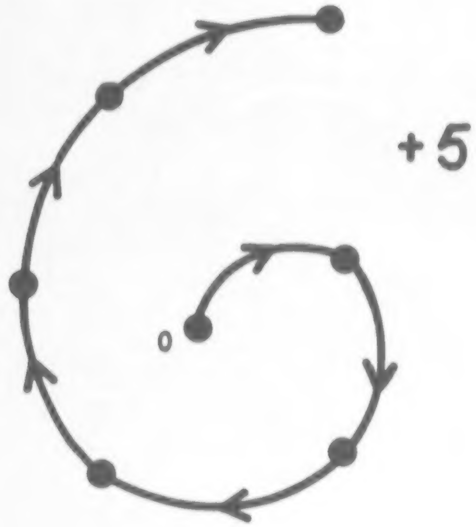
MATERIALS

Teacher: Colored chalk; 0-109 Numeral Chart

Student: Paper; colored pencils

DESCRIPTION OF LESSON

Draw this + 5 spiral on the board.



Point to the second dot from the center of the spiral.

T: What number is this?

S: 5.

T: Correct. 0 + 5 = 5.

Demonstrate this fact on the number line by starting at 0 and counting five spaces to the right (ending at 5).

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Point to the next dot in the spiral.

T: What number is this? (10) Yes; 5 + 5 = 10.

Demonstrate this by starting at 5 on the 0-109 Numeral Chart and counting five to the right (ending at 10). Repeat this process to label the next dot, but this time demonstrate the number story ("10 + 5 = 15") with your fingers.

T: 10 + 5 (hold up five fingers on one hand and point to each finger in turn) . . . 11, 12, 13, 14, 15.

Distribute paper and colored pencils to the students and instruct them to draw their own + 5 spirals like the one on the board, but allow them to choose any color they wish. Encourage them to extend the spiral as far as they can. Circulate around the room and provide help, where necessary.

S 48

S48.1 Addition Problem #5

CAPSULE LESSON SUMMARY

Two students bring brownies to school. Decide whether or not there are enough brownies so that everyone in the class can receive: at least one; at least two.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

Tell the following story or one similar to it, substituting the names of two students in your class.

T: Pretend that our class is going to have a party and that Robin and Shannon have brought brownies for the party. Robin made 21 brownies; will that be enough for our class? Shannon made 27 brownies; will Shannon's brownies be enough for our class?

Robin made 21 brownies and Shannon made 27 brownies; will there be enough brownies so that everyone can have at least one? Could everyone have at least two brownies?

The answers to these questions, of course, will depend upon the size of your class. Your students will probably agree about the first three questions, but disagree about the last one. To avoid a lengthy discussion, you might conclude simply that it is not yet clear whether or not every student could have at least two brownies.

T: Robin made 21 brownies and Shannon made 27 brownies. What calculation should we do to find how many brownies there are, in all?

S: "21 + 27".

Ask a volunteer to write this calculation on the board, near the Minicomputer. Students who may know the solution should be told not to reveal it yet; instead, they should whisper it to you. Ask one student to put 21 on the Minicomputer and another to add 27. Call on volunteers to make plays until you obtain the standard configuration of the answer (48). Ask a student to complete the number story at the board.

Invite several students to explain their methods of calculating "21 + 27", but be prepared to help them with their verbalizations. Some possible explanations include the following:

S: 20 + 20 = 40; 1 + 7 = 8; and 40 + 8 = 48.

S: 20 plus 20 is 40 . . . plus 7 is 47 . . . plus 1 is 48.

Write the completed number story on the board in both vertical and horizontal formats.

T: Will there be enough brownies for everyone to have at least two of them?

If necessary, ask how many brownies would be needed for everyone in the class to receive at least two. If no one can answer this, use the Minicomputer to calculate two times the number of students in your class.

If the class remains interested, you may wish to repeat this activity for a second story situation, in which two students bring 35, and 43 oatmeal cookies, respectively. Ask if there are enough cookies for everyone in the class to receive at least three.

After the calculation is completed on the Minicomputer, ask several students to explain how they obtained the answer.

S48.2 Number Line Activity

CAPSULE LESSON SUMMARY

Given the positions of 99 and 100 in the number line, locate numbers. Play the Number Line Game.

MATERIALS

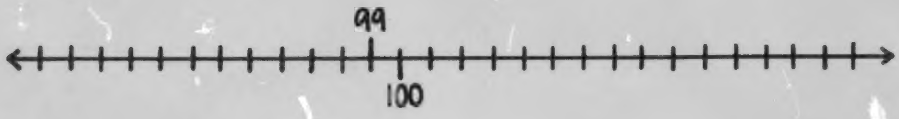
Teacher: None
Student: Worksheets S48.2* and **

DESCRIPTION OF LESSON

Exercise 1

Draw part of the number line on the board. The graduations should be spaced equally, at least ten centimeters apart. Make the line as long as your board will permit.

T: Here is a line with some numbers on it.



T: Who can show us where 101 is on this number line?

Put 101 in its proper place and then point to the position of 103.

T: What number goes here?

S: 103.

Label this point "103". Continue the activity until a variety of points along the number line has been labeled. Alternately ask a student to identify a point you are indicating, and ask a student to point to the position of a certain number.

After you have labeled a point about nine or ten spaces from the last point to the right, point to this last mark.

T: What number goes here?

Let students whisper their answers to you, and then ask a student to label the point. Point to the next to last mark from the right.

T: What number goes here? How do you know?

Encourage students to count backward.

Repeat this activity for the last point, and the next to last point to the left. If the students have difficulty labeling the last point to the left, count backward with them from the closest point which is labeled.

Exercise 2

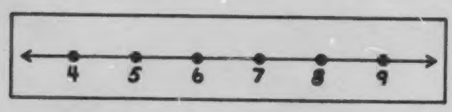
Play the Number Line Game[#] with a secret number between 0 and 50.
Play a second game using a secret number between 50 and 100.

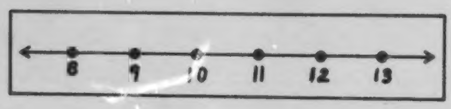
NOTE: Allow about ten minutes for work on the worksheets, even if this means postponing the Number Line Game. Worksheets 48.2* and ** are available.

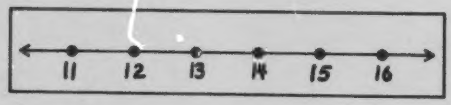
[#] See Lesson S24.2, pp.136 for a description of this game.

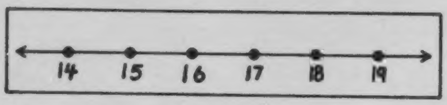
Name ______________________ S 48.2 *

Label the dots on these number lines.

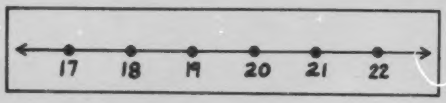


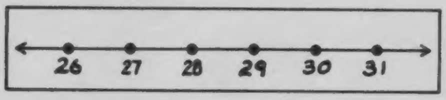


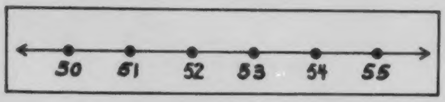


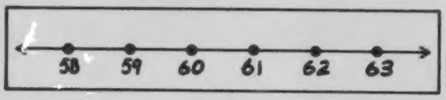


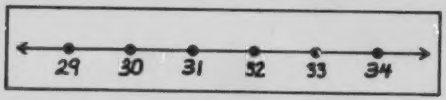
Label the dots on these number lines.





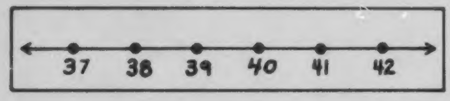


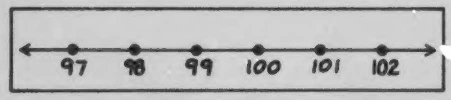


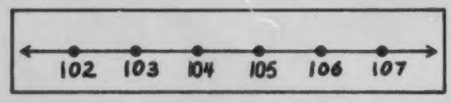


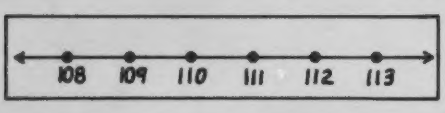
Name ______________________ S 48.2 **

Label the dots on these number lines.

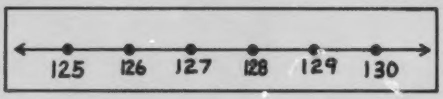


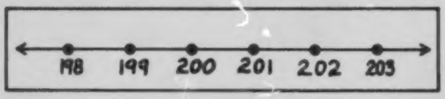


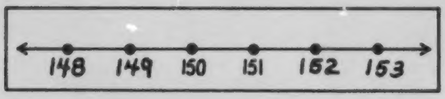


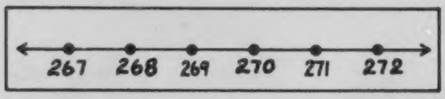


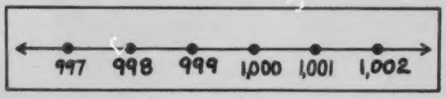
Label the dots on these number lines.











S49.1 The String Game with Two Strings #2

CAPSULE LESSON SUMMARY

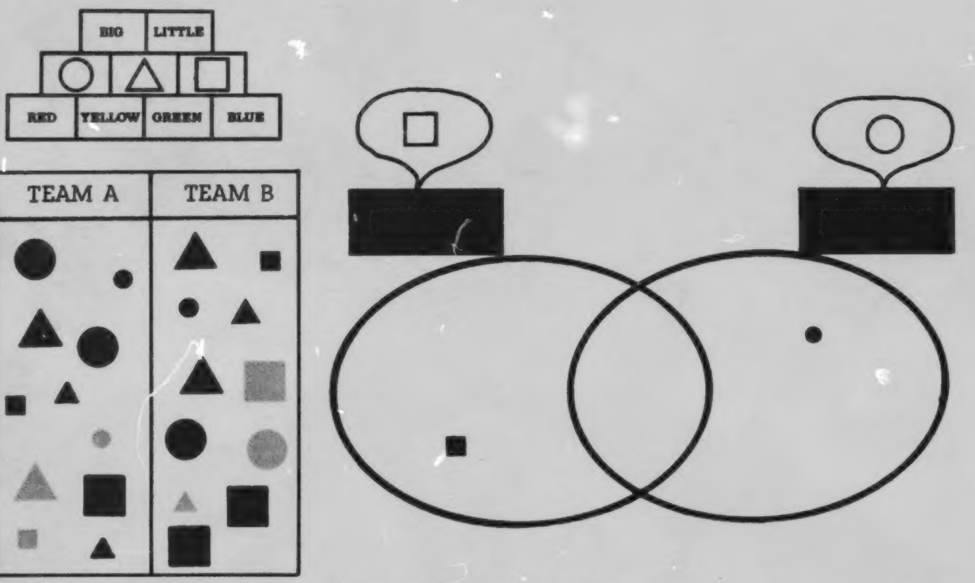
Play the A-Block String Game. Observe that in the given situation the middle region is empty and should be "hatched."

MATERIALS

Teacher: A-Block String Game kit; colored chalk
Student: None

DESCRIPTION OF LESSON

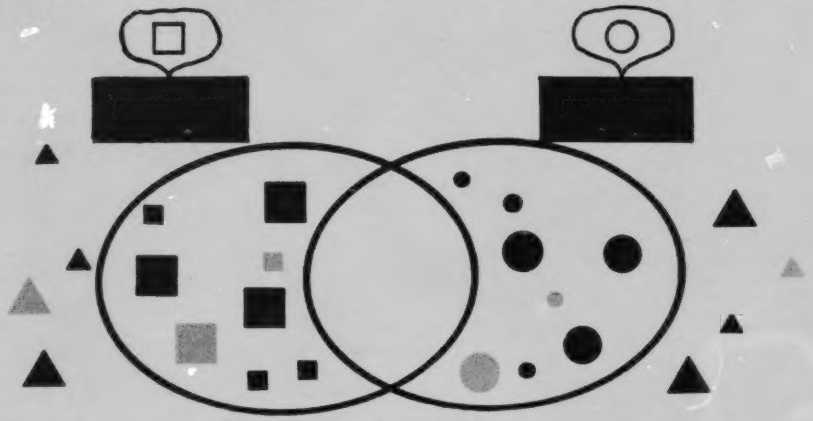
Before beginning the lesson, prepare the team board as in the following illustration, and divide the class into two teams. Draw two strings on the board and place the cards □ and ○ face down near the strings. Place two pieces in the picture as starting clues.



T: Today, we will play the String Game again. These white cards show what the strings are for, but the labels are hidden because the object of the game is for you to discover what they are. Look carefully at the pieces already in the picture; they are clues. Remember that the strings could be for any of these (point to the list of possible string labels above the team board). Let's read them together.

When you have done so, remind the students to remain silent, and then proceed to play the game. If a piece is correctly placed in the string picture, say "yes" and allow the piece to remain; if a piece is incorrectly placed, say "no" and return the piece to the team board. As before, students who correctly place an A-block piece should be given a second turn (but then, play returns to the other team).

To aid you in judging, the correct placement for all pieces is shown below.



When the game is over (a team wins by placing all of its pieces and identifying the strings), call the students' attention to the way the pieces are distributed.

T: Does anyone notice anything interesting about where the pieces are in this string picture?

S: There are none in the middle.

T: If I put the rest of the pieces in the picture, would there be any in the middle?

S: No.

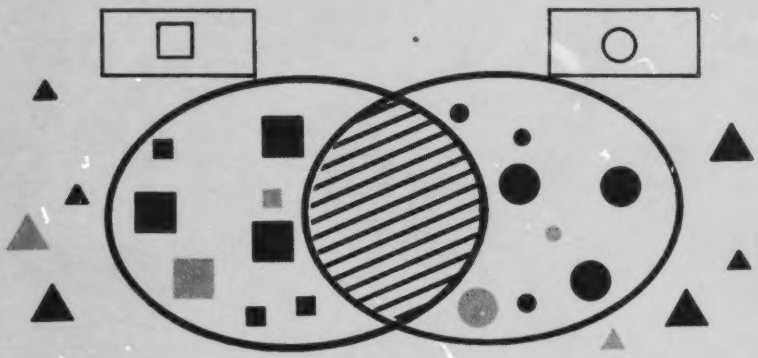
T: Why not?

Ask the students to consider this for a moment before answering.

S: No piece is both a square and a circle!

T: That's right; and there is an easy way to show that nothing is in the middle of our picture.

Use white chalk to "hatch" the center region of the string picture.



T: This will remind us that the middle is empty; none of the A-block pieces goes there.

S 49

S49.2 Story Problem #2

CAPSULE LESSON SUMMARY

Solve a problem involving the number of feet (legs) there would be, in all, when each of six octopi has eight legs.

MATERIALS

Teacher: None
Student: Paper; colored pencils

DESCRIPTION OF LESSON

T: Who knows what an octopus is?

Let the students describe an octopus, being sure someone mentions that an octopus has eight legs.

T: One day, a family of six octopi[*] visits a shoe store because all of the octopi need new shoes. How many shoes are needed, for all the octopi together? (48) To find out, you may draw any kind of picture you wish.

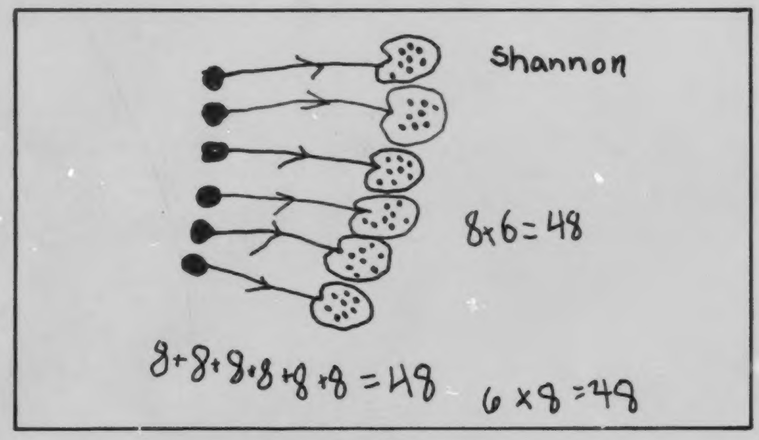
As the students work, do not offer any guidance, although you may want to repeat the details of the story. Students who finish early should be asked to write number stories about their pictures. Show the class several completed pictures and discuss how each picture relates to the problem.

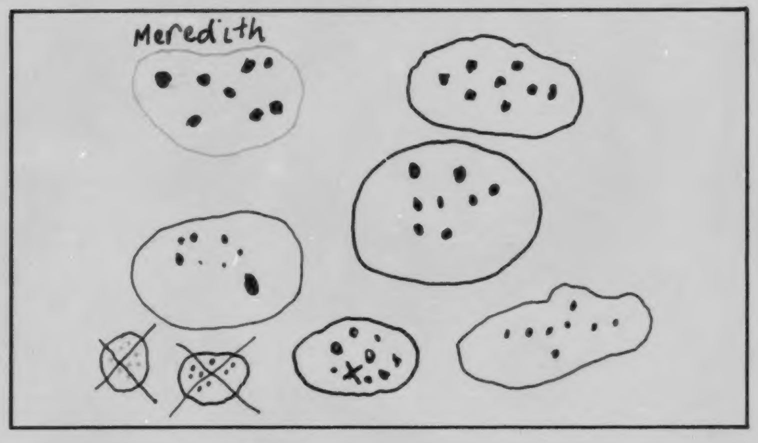
NOTE: Incorrect answers may result from simple counting errors; do not be concerned about this. What is much more important, at this stage, is how well the students understand the problem and what methods they employ in attempting to solve it.

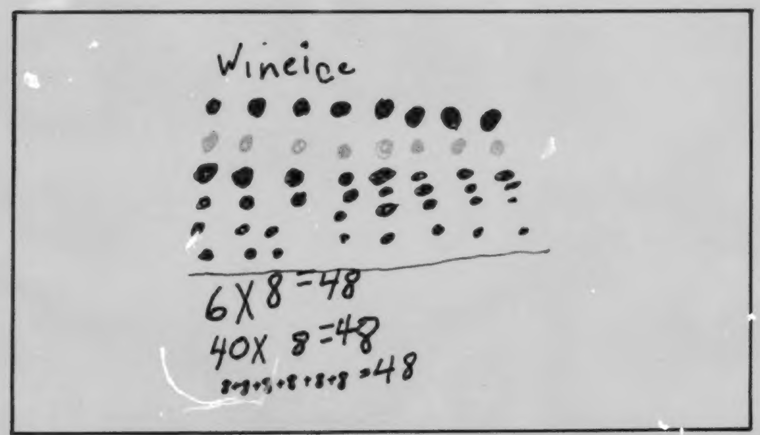
---

[*] If necessary, explain to the class that "octopi" is the plural form of "octopus."

The example pictures below were drawn by CSMP students. Note that one of the students, Wineice, wrote "40 x 8 = 48" when she meant to write "40 + 8 = 48". The rest of her work, however, demonstrates an understanding of the problem and the calculations involved.







S50 Adjustment Day #5

NOTE: See page 16, Section One NOTES TO THE TEACHER in CSMP Mathematics for the First Grade, Part I for a full explanation of the purpose of scheduled adjustment days.

If work is proceeding on schedule, you may wish to repeat a previous lesson, either for a small group of students or for the entire class. Often the basic content of a particular lesson can be made to appear completely different by adjusting a story line and/or the numbers in the story. Consider the needs of your class in choosing lessons to repeat.

You may wish to give your students more practice in working with the functions 2 x and $\frac{1}{2}$x. If so, the lessons S35.1 Doubling and Halving #1; S36.2 Booker's Bakery; S43.1 Length #3; and S43.2 1/2 x and 2 x Arrows contain a variety of appropriate activities.

To aid your students' understanding of subtraction problems, you may choose to offer variations of one of these subtraction lessons: S38.2 A Subtraction Arrow Picture; S42 Subtraction Problem #4; or S44.2 Subtraction and a +1 Arrow Picture.

S41.1 Combinatorics with Three Digits #1 is another enjoyable lesson you may wish to repeat; it provides experience in ordering numbers and serves as a preparation for later experiences in combinatorics.

If you omitted the worksheets from any previous lesson, you may wish to distribute them today, after an appropriate warm-up activity.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with S51.1 Detective Story #1.

EARLY WARNING!

Among the next nine classroom lessons is one which requires extra preparation time and which makes use of materials not included with the CSMP classroom set. The lesson is listed here for your convenience in preparing for it. A more detailed description of the materials is found on the first page of the lesson.

S57.2 Area #1: five cardboard squares (10 cm x 10 cm)

S 51

S51.1 Detective Story #1

CAPSULE LESSON SUMMARY

Count by ones so that every student says a number. Then, ask every third student to repeat the number he or she said, thus showing how to count by threes. Solve a detective story in which the secret number is a multiple of 3 and in which other clues are given through a string picture and an arrow picture.

MATERIALS

Teacher: Minicomputer set; colored chalk
Student: None

DESCRIPTION OF LESSON

NOTE: Before class begins, write the numeral "12" on a piece of paper and fold the paper so that the numeral cannot be seen by the class. This "secret number" will be needed for Exercise 2 of the lesson.

Exercise 1: Counting Activity

Follow your usual procedure to begin this counting activity with the students, explaining to them the order in which they should count aloud by ones (from the front to the rear, from right to left, etc.), beginning with "1" and continuing around the room until all of the students have counted. Ask for predictions of the last number to be counted. After the students count aloud, compliment any students who correctly predicted the final number.

Repeat this counting sequence, asking every third student to stand up, and instructing the class to count by ones again, with the seated students saying their numbers softly, and the students who are standing saying their numbers loudly. Tell the students to remember their numbers.

T: Now, only the students who are standing will say their numbers. They will be counting by threes. Listen carefully because in a moment, we will all count by threes.

Tell the students who are standing to say their numbers in order, assisting any students who have difficulty.

T: Now let's count together by threes. The students who are standing may sit down when we say their numbers.

As a group, count by threes up to 30. Do this at least twice, and the second time point to the appropriate numbers on the number line.

Exercise 2: Detective Story

Show the students your folded piece of paper (on which "12" is written), telling them that a secret number is written on the paper and that they must discover it.

First clue

T: The secret number is one of the numbers we say when we count by threes, as we just did. Let's write these numbers on the board.

Ask the students to suggest numbers. (If the numbers are not suggested in order, allow enough space for you to record them in order.) If necessary, remind the class that the secret number is one of the numbers they say when they count by threes.

3, 6, 9, 12, 15, 18, 21, 24, 27, 30, 33, ···

At this point, the students will very likely try to guess the secret number. Remind the class that detectives follow clues until they are absolutely certain they have discovered the secret.

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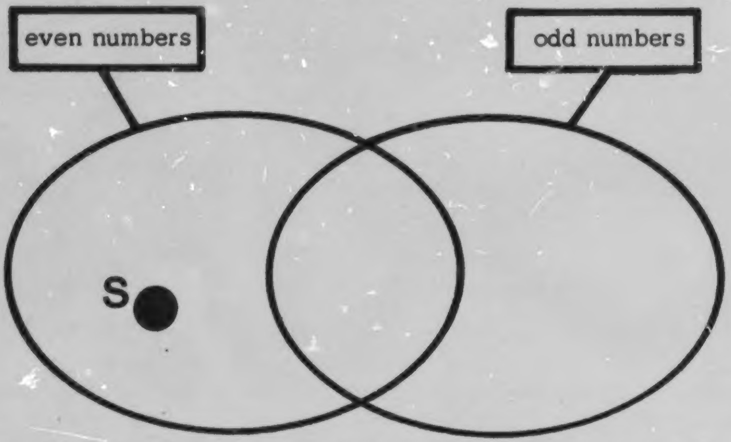
Second clue

Draw this string picture on the board and point to the dot.



T: This dot is for the secret number. What does this clue tell us?

S: It's an even number.

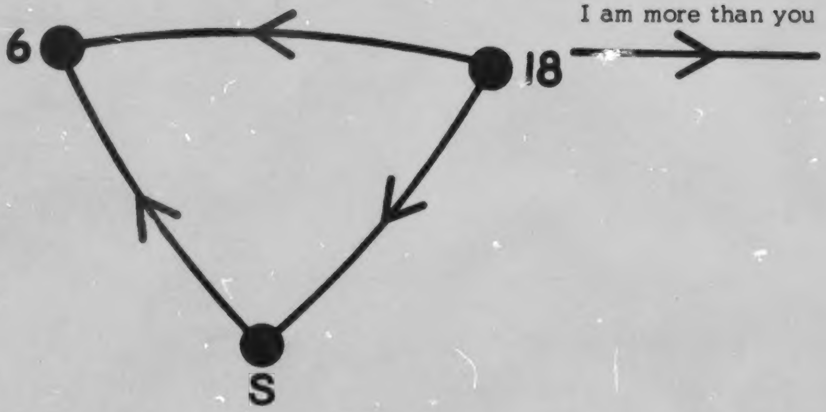
T: The secret number is an even number. Which of the numbers in our list could be the secret number?

As each number is suggested, ask the students if it is even. If the suggested number is even, circle it; if not, cross it out. When there is disagreement about whether a number is even or odd, put that number on the Minicomputer, reminding the students that odd numbers always have a checker on the 1-square (while even numbers can be put on the Minicomputer with no checkers on the 1-square). Continue until all of the numbers on your list have been considered.

~~3~~, ⑥, ~~9~~, ⑫, ~~15~~, ⑱, ~~21~~, ㉔, ~~27~~, ㉚, ~~33~~, ...

Erase all of the numbers which have been crossed out and draw this arrow picture on the board.

Third clue



T (pointing to the dot labeled "s"): Here is the secret number in this arrow picture. The red arrows are for "I am more than you". Tell me with whispers what you think the secret number is.

Allow several students to whisper their answers to you. You may need to remind the class that the secret number is one of the numbers in the list. Ask a student who knows the secret number (12) to label its dot at the board.

T: Could 12 be the secret number?

Allow the students to comment; then, ask if 12 is in the list and if the arrow picture is correct as labeled. (If necessary, call on volunteers to read aloud the number stories told by the arrows; e.g., "18 is more than 12," etc.) The class should agree that 12 could be the secret number.

T: Are there any other numbers which could be the secret number?

If any other number is suggested, check it with the class against the list and the arrow picture. Finally, unfold your piece of paper to reveal that 12, indeed, is the secret number.

NOTE: The string picture from this story will be used again for today's second lesson, Lesson S51.2 Odd and Even Numbers.

S51.2 Odd and Even Numbers

CAPSULE LESSON SUMMARY

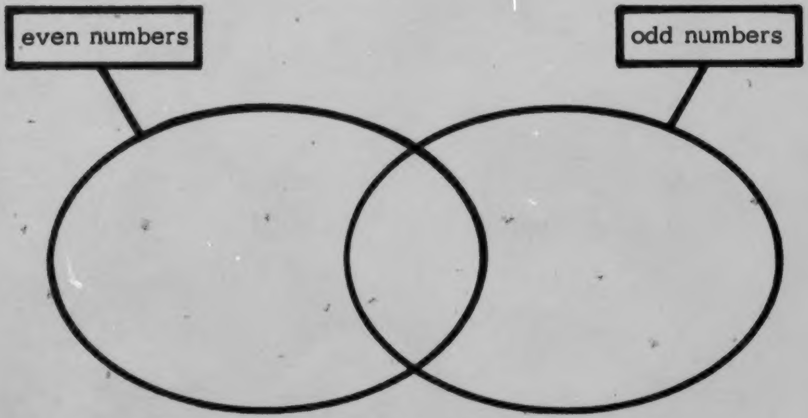
Put numbers in a string picture in which one string is for even numbers and the other string is for odd numbers.

MATERIALS

Teacher: Minicomputer set
Student: Colored pencils; paper; (optional: Minicomputer set)

DESCRIPTION OF LESSON

Erase everything from the board except this string picture, and display four Minicomputer boards.



T: Let's put some whole numbers in this string picture.

Ask a student to suggest a number between 20 and 100. Ask a second student to put the number on the Minicomputer.

T: Is this number even or odd? How do you know?

Guide the students' comments until it is clearly stated that even numbers may be shown without a checker on the 1-square, while odd numbers always have a checker on the 1-square.

T: Who can draw and label a dot for this number in our string picture?

Continue in this way until at least two odd and two even numbers are in the string picture. (Students may suggest that some large numbers be included in the picture; if a suggested number has more than four digits, you can draw additional Minicomputer boards on the chalkboard and draw dots for checkers.)

Ask the students to copy the string picture from the board onto their papers and to include many more numbers in their string picture. Do not suggest that the middle region of this string picture (i.e., the intersection of the odd and even numbers) be hatched; allow the students to discover this fact themselves. Students who encounter difficulty should be encouraged to use individual Minicomputers to determine whether a number is even or odd.

S 52

S52.1 Eli's Magic Peanuts #3

CAPSULE LESSON SUMMARY

Eli arrives home after gathering peanuts, only to find that his bag is empty! Discuss what could have happened.

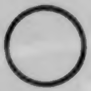
MATERIALS

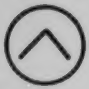
Teacher: None
Student: None

DESCRIPTION OF LESSON

T: Last week Eli was walking in the jungle gathering peanuts. Poor Eli still hadn't learned the difference between regular peanuts and magic peanuts.

Ask one student to draw a regular peanut on the board and another to draw a magic peanut.





T: Eli gathered peanuts all day long but when he got home and opened his bag, he found it was empty! What could he have put in his bag that day?

S: Regular peanuts and magic peanuts.

T: How many regular peanuts and how many magic peanuts?

Accept suggestions from the class about what Eli put in his bag that day, recording the number story for each suggestion on the board.

S: Six regular peanuts and six magic peanuts.

T: Yes; that would leave zero peanuts in the bag.

$$6+\hat{6}=0$$

Do not discourage more imaginative suggestions; for example,

S: He found six regular peanuts and then ate them.

T: Maybe. He could have put six regular peanuts into the bag and taken out six. Then there would be none left.

$$6-6=0$$

S: He found six regular peanuts, ate one of them, and put in five magic peanuts.

T: Yes. He could have put six regular peanuts into the bag and taken out one. Then, how many regular peanuts would be in the bag? (Five) He could then put in five magic peanuts and that would leave zero peanuts in the bag.

Continue to accept suggestions for as long as the class is interested.

S52.2 A - 3 Arrow Road

CAPSULE LESSON SUMMARY

Use return arrows to help label the dots in a - 3 arrow road.

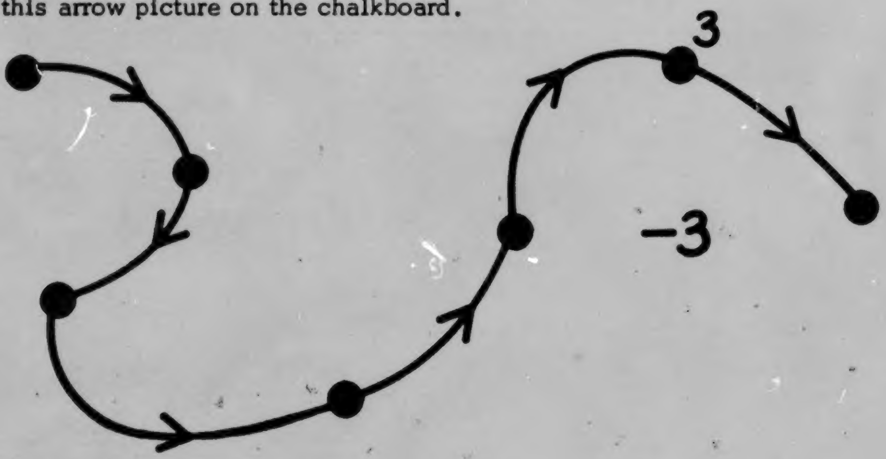
MATERIALS

Teacher: Colored chalk

Student: Colored pencils ; Worksheet S52.2

DESCRIPTION OF LESSON

Draw this arrow picture on the chalkboard.



T: What are the red arrows for?

S: - 3.

T (pointing to the dot at the extreme right): Who can label this dot?

Call on a volunteer to label the dot ("0") and then check the label.

T (tracing the arrow from 3 to 0): 3 minus 3 is 0. Is that right?

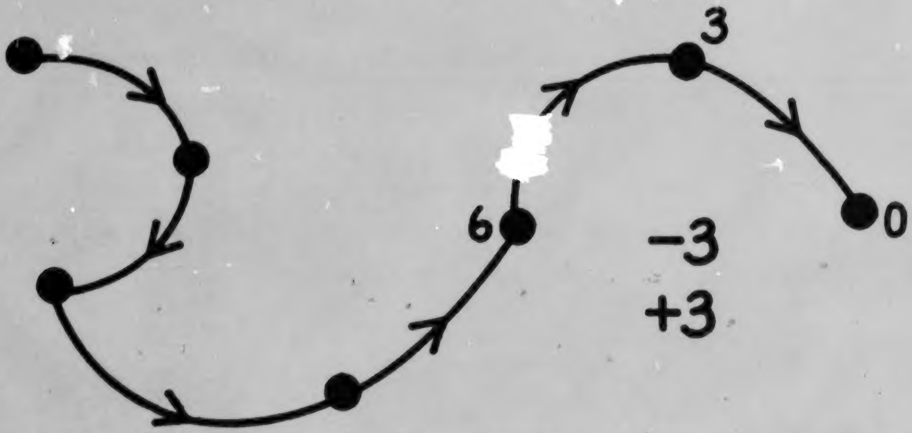
S: Yes.

Demonstrate this fact by starting at 3 on the number line and hopping three spaces to the left. If the dot is labeled incorrectly, use the same procedure to demonstrate and ask another volunteer to label the dot. Point next to the dot to the left of the dot for 3.

T: Who can label this dot?

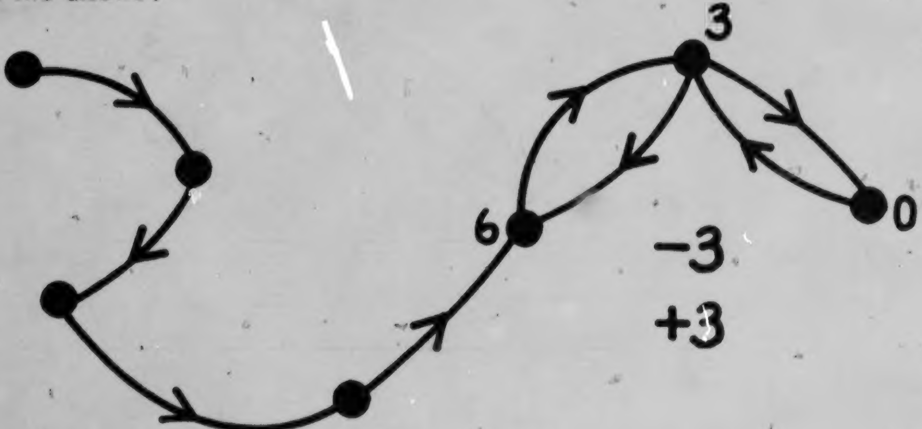
Use the procedure described above to check the label of this dot ("6").

In blue, write "+3" near your picture.



T: Who can draw a blue + 3 arrow?

Call on one or two students to draw blue arrows. Most likely they will draw these two arrows:



S 52

In each case trace the + 3 arrow as you say the corresponding number story.

One-by-one, call on volunteers to add other blue arrows, asking them to explain why each arrow may be drawn. In the case of a blue arrow starting at 3, for example, two possible explanations are:

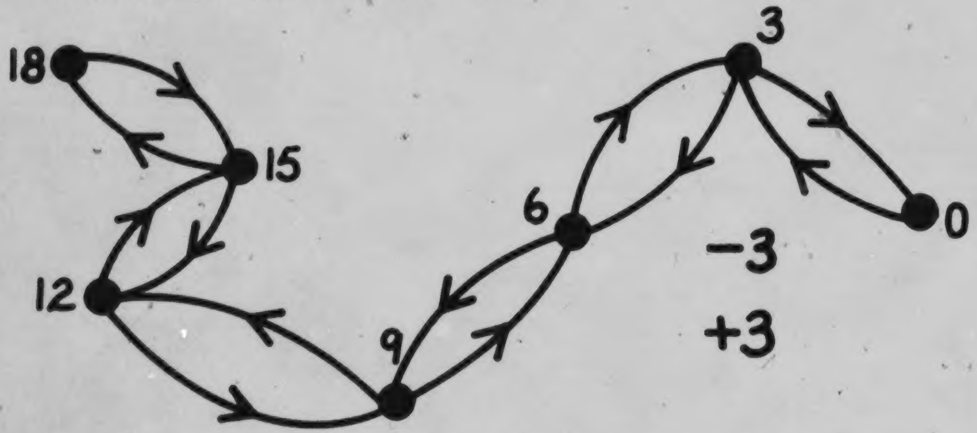
S: 3 + 3 = 6 and this dot (to the left of 3) is 6, because 6 - 3 = 3.

S: I can draw a blue + 3 arrow from 3 to 6 because there is a red - 3 arrow going the other way, from 6 to 3.

If no one offers this second explanation wait until all the arrows are drawn and ask the students if they notice anything unusual about the red and the blue arrows.

S: Wherever there is a red arrow going in one direction, there is a blue arrow returning, in the opposite direction.

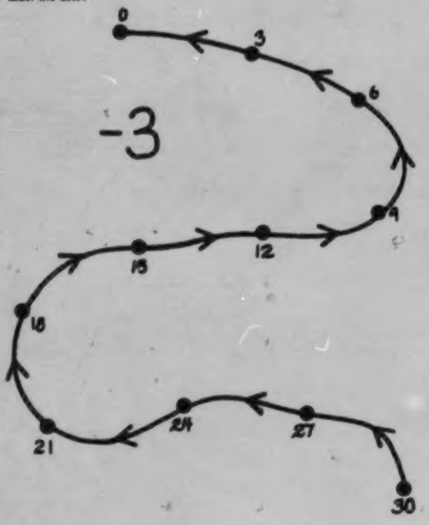
The completed arrow picture is shown below.



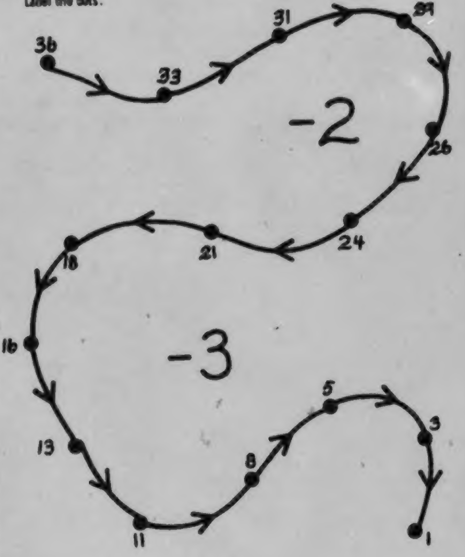
Distribute copies of Worksheet S52.2 and explain the directions. On the front side, students should label the dots and draw + 3 return arrows in any color other than red; and on the reverse side, they should draw + 3 and + 2 return arrows in any colors other than red and blue.

Name ______________ S 52.2

Label the dots.



Label the dots.



S 53

S53 "The Little Dreamer"

CAPSULE LESSON SUMMARY
Read and discuss the storybook "The Little Dreamer".

MATERIALS
Teacher: "The Little Dreamer" storybook
Student: "The Little Dreamer" storybook (one copy for each two students)

DESCRIPTION OF LESSON

Although "The Little Dreamer" uses the mathematical languages of dots, arrows, and strings, it is a story in the truest sense and should be presented that way to your class. Distribute the storybooks at the beginning of class so that the students can follow along with you. Then, read "The Little Dreamer" to your class as you would any other story. Do not overemphasize the mathematical aspects of the story; you may increase students' participation, however, by posing questions and by asking them to identify various parts of the picture.

Here are some specific suggestions for activities as you progress through the storybook.

page 6:
Ask the students to point to the nest (on page 5) that has three birds living in it; that has only one bird living in it; that is empty; that has two birds living in it.

page 7:
You might ask the students to invent another story about this picture.

When you have finished reading the story, allow some time for the class to talk about the story or draw pictures related to it.

There is a narration tape[*] available for the story "The Little Dreamer". On another occasion during the year, you could listen to it as a class, or you could let individual students listen to it. In any case, at least one copy of the storybook (with or without the accompanying tape) should be available for students who wish to look through it in their spare time.

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[*] This tape may be obtained by sending a blank, 30-minute cassette tape to CEMREL - CSMP. The recorded tape will be returned to you free of charge. Be sure to mention the title of the story in your request for the tape to be recorded and include a stamped, self-addressed envelope.

S 54

S54.1 Mental Arithmetic with +1 Arrow Pictures

CAPSULE LESSON SUMMARY

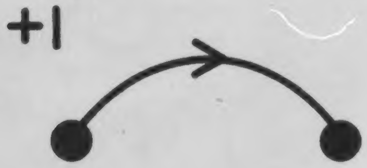
Use a +1 arrow picture to do some mental arithmetic activities.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



T: What is this red arrow for?

S: +1.

T: If this number (point to the dot on the left) is 5, what is this number (point to the dot on the right)?

S: 6.

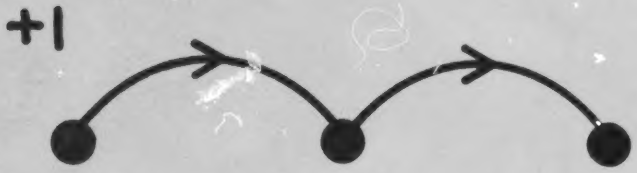
Continue this activity for a few minutes. Try to include many students by alternating large numbers with smaller ones.

T: If this number (point to the dot on the right) is 8, what is this number (point to the dot on the left)?

S: 7.

Continue this new activity for a few minutes, again trying to include many students.

Add a second red arrow to your drawing.



T: If this number (point to the left-most dot) is 3, what is this number (point to the right-most dot)?

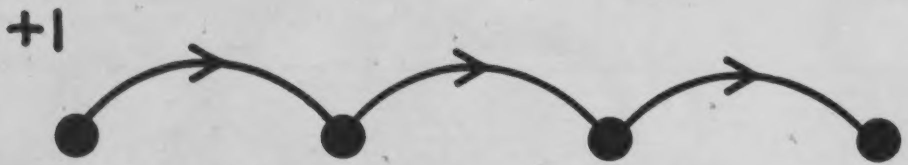
S: 5.

Continue this activity for a few minutes before reversing the question.

T: If this number (point to the right-most dot) is 10, what is this number (point to the left-most dot)?

S: 8.

If your class is interested, extend the arrow picture with a third red arrow and ask similar questions.



S 54

Continue alternating large numbers with small ones to involve all of the students. If your class has difficulty with any of these activities you may wish to draw some "return" arrows, or to label the middle dots, or to refer to the classroom number line.

S54.2 Subtraction Problem #5

CAPSULE LESSON SUMMARY

With the help of the Minicomputer, decide how many chicks are left when 56 out of 100 chicks die. Do sequences of subtraction calculations on the Minicomputer.

MATERIALS

Teacher: Minicomputer set
Student: Minicomputer set

DESCRIPTION OF LESSON

Exercise 1

Tell your class the following story or one similar to it, substituting the name of one of your students to be the "star".

T: For Easter, Tammy's family went to visit her grandfather who lives on a farm. While Tammy was there, her grandfather bought 100 baby chicks. What is a chick?

Allow some time here for a discussion, which should include such facts as: chicks are baby chickens; they are usually sold 100 at a time (in large, shallow boxes); and they are frail, delicate creatures that require warm surroundings and special care.

T: Yesterday Tammy received a letter from her grandfather, which said that 56 of the chicks had died.

You may wish to let the students discuss what could cause the chicks to die.

T: How many chicks are still alive?

S 54

Record some of the students' predictions on the board. If no one suggests using the Minicomputer, suggest it yourself. Display three Minicomputer boards and ask a student to put 100 on the Minicomputer.

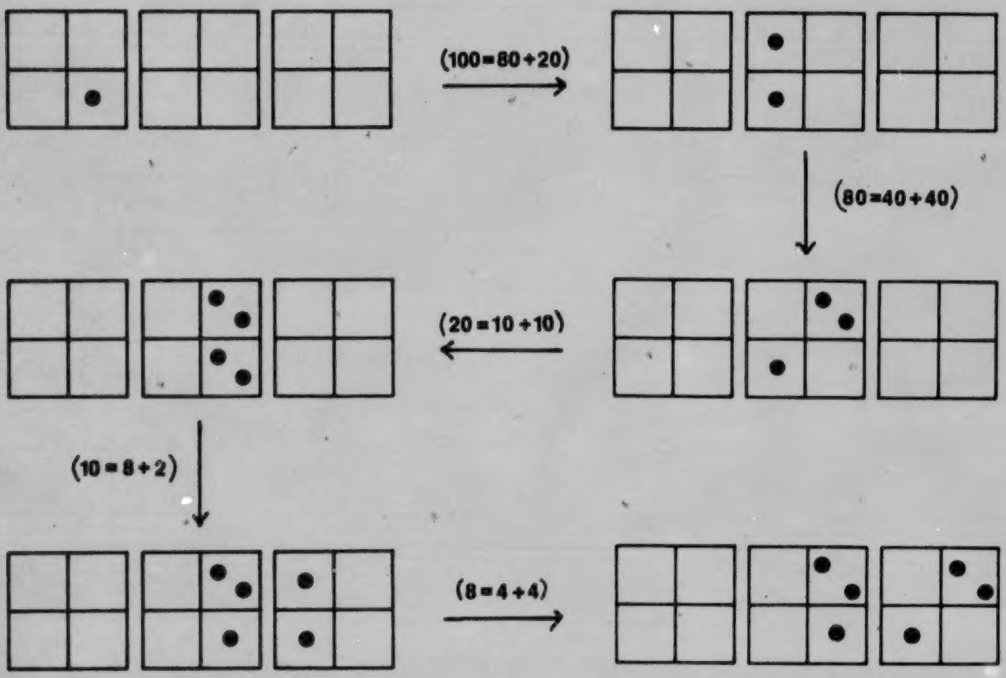
T: There were 100 chicks, but 56 of them died. What calculation should we do?

S: "100 - 56".

Write the subtraction problem on the board. Some students may insist at this point that there is no 56 on the Minicomputer to take away. Be patient; if no one suggests making a backward play, make the "100 = 80 + 20" play yourself.

Ask the class where the checkers for 56 would be and ask if someone could make backward plays to put checkers on those squares. Students should then suggest other backward plays. Continue this activity until 56 can be removed from the Minicomputer.

A possible sequence of plays is shown below.



Call on a volunteer to take away 56 (shown on the preceding page with red checkers) from the number on the Minicomputer and complete the number story on the board.

$$100 - 56 = 44$$

Compliment students who correctly predicted the answer and ask if they can explain their methods.

Exercise 2

Each student will need one individual Minicomputer sheet (two Minicomputer boards) and several checkers. Erase the chalkboard and remove the checkers from the demonstration Minicomputer.

T: Put 35 on your Minicomputers.

Check the students' Minicomputers and ask one student to put the standard configuration for 35 on the demonstration Minicomputer. Write this substration problem on the board.

$$35 - 4 =$$

T: Calculate "35 - 4" on your Minicomputers.
What number is 35 - 4? (31)

Invite a student to take away 4 from the number on the demonstration Minicomputer and to complete the number story. Frequently check that the students have the appropriate number on their Minicomputers. Write a new problem on the board.

$$35 - 4 = 31$$
$$31 - 20 =$$

S 54

T: Calculate "31 - 20" on your Minicomputers.
Which number is 31 - 20? (11)

Invite a student to take away 20 from the number on the demonstration Minicomputer and to complete the number story. Continue this activity with two more subtraction problems in turn. Answers are in the boxes.

$35 - 4 = 31$

$31 - 20 = 11$

$11 - 1 = \boxed{10}$

$10 - 10 = \boxed{0}$

Follow a similar procedure for the following sequences of subtraction problems (or similar ones appropriate for the numerical ability of your students), none of which require backward plays. Answers are in the boxes.

Put 57 on all Minicomputers.

$57 - 4 = \boxed{53}$

$53 - 10 = \boxed{43}$

$43 - 40 = \boxed{3}$

$3 - 3 = \boxed{0}$

Put 69 on all Minicomputers.

$69 - 40 = \boxed{29}$

$29 - 1 = \boxed{28}$

$28 - 8 = \boxed{20}$

$20 - 20 = \boxed{0}$

Put 75 on all Minicomputers.

$75 - 40 = \boxed{35}$

$35 - 1 = \boxed{34}$

$34 - 0 = \boxed{34}$

$34 - 30 = \boxed{4}$

$4 - 4 = \boxed{0}$

If your class successfully completes these problems, you may wish to continue to the following sequence, which does require backward plays.

Put 48 on all Minicomputers.

$48 - 8 = \boxed{40}$

$40 - 20 = \boxed{20}$

$20 - 10 = \boxed{10}$

$10 - 10 = \boxed{0}$

S 55

S55.1 1/2x on the Minicomputer #1

CAPSULE LESSON SUMMARY

Decide how many pennies each of two people will receive if 22 pennies are divided equally between them. Draw a corresponding string picture and tell number stories about it. Find one half of a number using the Minicomputer.

MATERIALS

Teacher: Minicomputer set; colored chalk
Student: None

DESCRIPTION OF LESSON

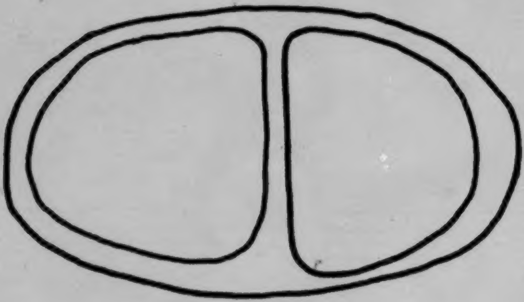
T: Let's pretend I'm going to give away 22 pennies. I'll give one half of the pennies to one person and one half to another person. How many pennies will each person get?

Accept several guesses and record them on the board. Then, in colored chalk, draw a large string on the board.

T: This string is for the 22 pennies. Remember that each person will get one half of the pennies. How many strings should I draw inside this string?

S: Two.

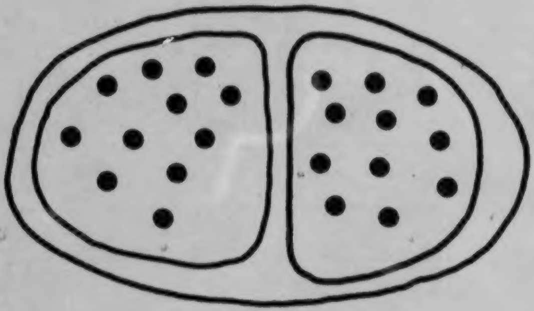
In two new colors of chalk, draw two strings inside the first string.



T: How can we share the pennies?

S: Give a penny to each person, then another to each person, and so on until the pennies are all gone.

Let the students draw dots to show the distribution of the pennies.



T: What is $\frac{1}{2}$ x 22 (read: "one half of twenty two")?

S: 11.

Write the corresponding number story on the board.

$$\frac{1}{2} \times 22 = 11$$

T: The "2" (point to the "2" in "$\frac{1}{2}$") indicates two strings and the "1" (point to the "1" in "$\frac{1}{2}$") means we count the pennies in just one of the strings. Who knows some other number stories about this picture?

S: 11 + 11 = 22.

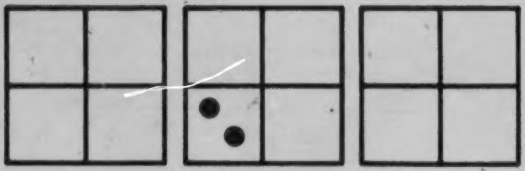
S: 2 x 11 = 22.

S: 22 - 11 = 11.

S 55

On the board, write any suggested number stories which pertain to the situation.

Put the following configuration on the Minicomputer.



T: What number is on the Minicomputer? (40)
Who can take away one half of this number on the Minicomputer?

Choose a volunteer to take away one of the checkers.

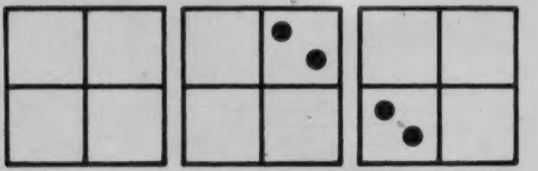
T: What is $\frac{1}{2}$ x 40 (read: "one half of 40")?

S: 20.

Write the corresponding number story on the board.

$$\frac{1}{2} \times 40 = 20$$

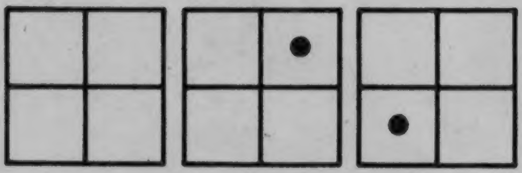
Put a new configuration on the Minicomputer.



T: What number is this? (84)

Who can take away one half of this number?

Choose a volunteer to do so.



T: What is $\frac{1}{2} \times 84$?

S: 42.

Write the corresponding number story on the board.

$$\frac{1}{2} \times 84 = 42$$

S 55

S55.2 Tangram Puzzles #2

CAPSULE LESSON SUMMARY

Make certain designs using all seven Tangram pieces.

MATERIALS

Teacher: None
Student: Tangram set; Tangram booklet

DESCRIPTION OF LESSON

Distribute Tangram sets and Tangram booklets to the students, and allow the class to continue working to solve the Tangram puzzles. Solutions for the Tangram puzzles follow Lesson F36.2 in the Part I Teacher's Guide, pages 278-285.

This is the last time in the suggested schedule that is allotted for work with the Tangram puzzles. You may wish to make them available to students later during the year or to let the students take their booklets home.

S56 Arrow Road for Money

CAPSULE LESSON SUMMARY

Use a + 5 arrow road to discover a half-dollar's equivalent in nickels. Add + 10 arrows to decide a half-dollar's equivalent in dimes and add + 25 arrows to decide its equivalent in quarters.

MATERIALS

Teacher: Colored chalk
Student: Worksheet S56.2; colored pencils

DESCRIPTION OF LESSON

Exercise 1

Begin the lesson with about five minutes of mental arithmetic.

T:	1 + 1 = . . . ?	S:	2.
	10 + 10 = . . . ?		20.
T:	2 + 1 = . . . ?	S:	3.
	20 + 10 . . . ?		30.
T:	2 + 2 = . . . ?	S:	4.
	20 + 20 = . . . ?		40.

Continue in this manner, asking first for the sum of two numbers where the sum is less than 10 and then, asking for the sum of two numbers which are ten times the original numbers.

If the class encounters any difficulty, use the 0-109 Numeral Chart to illustrate a particular calculation. Before long, most of the students should recognize the pattern of your questions.

S 56

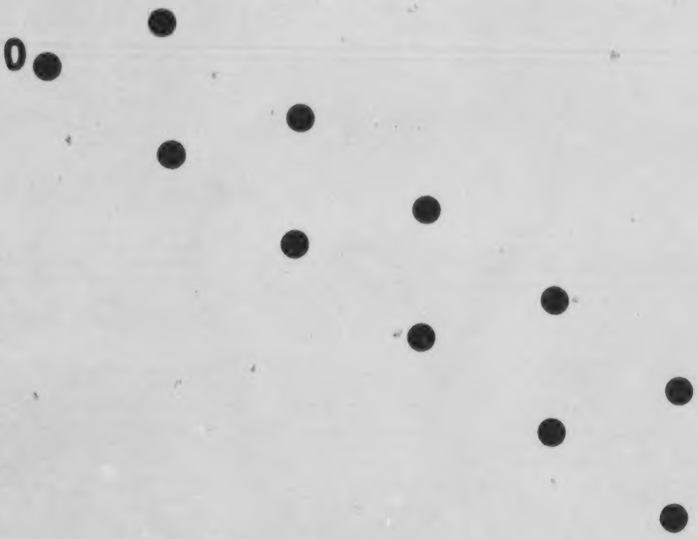
Exercise 2

Distribute copies of Worksheet S56.2.

T: How many pennies make a dollar? (100)
How many pennies make a half-dollar? (50)
How many pennies make a nickel? (5)
How many nickels make a half-dollar?

Many students in your class will probably not know the answer to this last question.

T: Let's draw an arrow picture to find out.



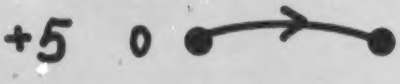
T: This picture is just like the one on your worksheets. When we draw arrows or label dots at the board, do it at your desks, too.

How many pennies did we say make a nickel? (Five)
So, when we add a nickel, it's the same as adding five pennies.
Here's how we show that.

In red, write "+ 5" near your picture on the board; remind the students to do likewise.

T: And each time we add a nickel, we will draw a red arrow.

Draw the first red arrow.



T: I have zero pennies and I add a nickel. How many cents do I have now?

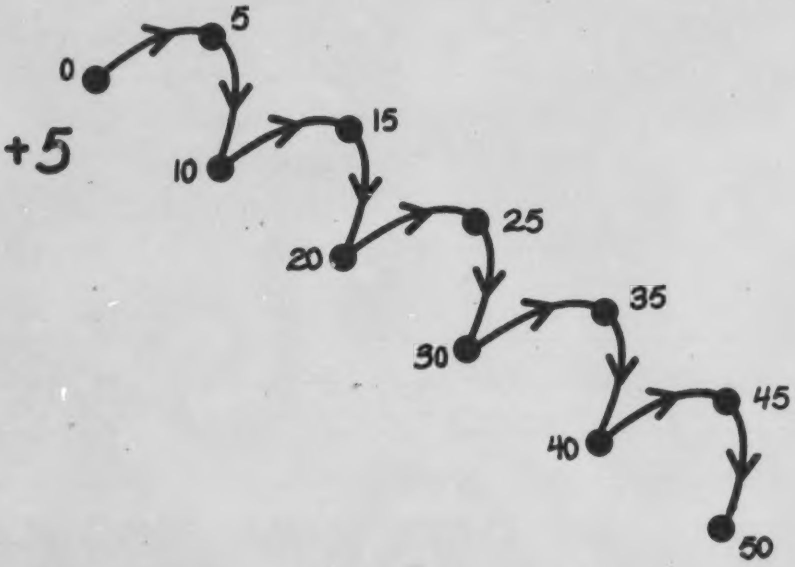
S: 5¢.

Label the dot "5" and draw the next red arrow.

T: I have 5¢ and I add another nickel. How many cents is that?

S: 10¢.

Choose a volunteer to label this dot, and continue in this manner until the last dot has been labeled.



S 56

T: Now we have 50¢ and a half-dollar is 50¢.
How many nickels did we count?

S: Ten.

T: Should we count the dots or the arrows to check?

S: The arrows; we drew an arrow for each nickel.

T: Right. How many nickels make a half-dollar? (Ten)
How many nickels make a whole dollar? (Twenty)
How do you know?

S: Because 10 + 10 = 20.

S: Because 2 x 10 = 20.

T: How many pennies make a dime? (Ten) How many nickels make a dime? (Two) Ten nickels make a half-dollar. How many dimes make a half-dollar?

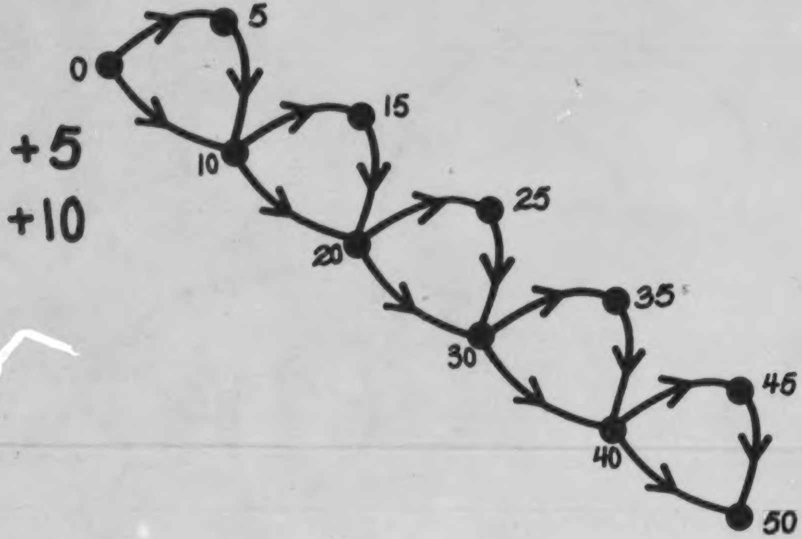
Some students may realize that five do, but others may not be certain. In any case, call the students' attention to the arrow picture once again.

T: Let's start again at 0 and draw a blue arrow every time we add a dime.
One dime makes how many pennies? (Ten)

In blue, write "+10" near the picture and choose a volunteer to draw the first blue arrow.

T: I start with no pennies and I add a dime; do I have 10¢? (Yes)
Who can draw a blue arrow starting at 10?

Ask a volunteer to do so and continue until the last blue arrow has been drawn.



T: That makes 50¢ again. How many dimes make a half-dollar? (Five)
How many dimes make one dollar? (Ten)
How do you know?

S: Because 5 + 5 = 10.

S: Because 2 x 5 = 10.

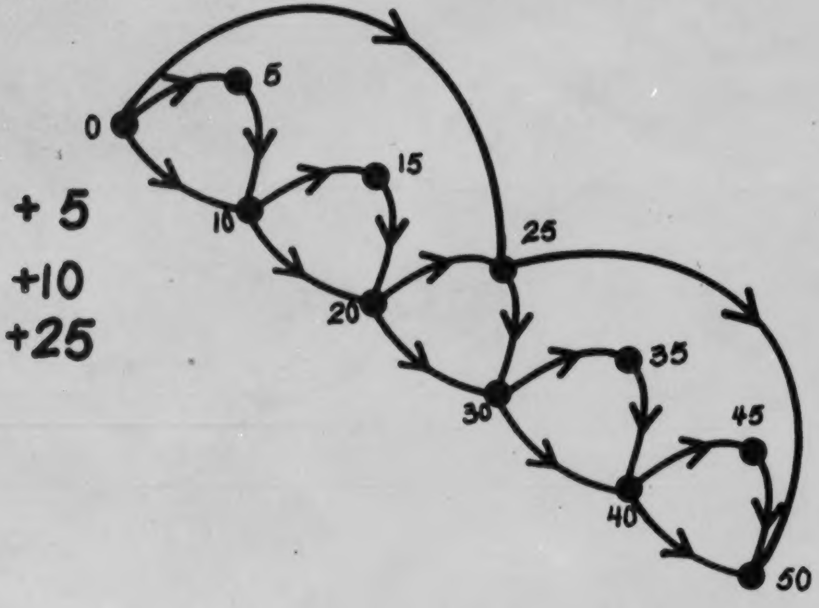
T: How many pennies make a quarter? (25)
Yes, a quarter is 25¢.
How many quarters make a half-dollar?

Many students can probably answer this last question. In any case, continue.

T: Let's begin at 0 again and draw a green arrow each time we add a quarter. How much money is a quarter? (25¢)

S 56

In green, write "+ 25" near the picture. Call on volunteers to draw green arrows from 0 to 25 and from 25 to 50.



T: How many quarters make a half-dollar? (Two)
How many quarters make one dollar? (Four)
How do you know?

S: Because 2 + 2 = 4.

S: Because 2 × 2 = 4.

S57.1 Addition Story #2

CAPSULE LESSON SUMMARY

Pair numbers which are 10-friends to help find the sum of the whole numbers 1 through 10.

MATERIALS

Teacher: None
Student: None

DESCRIPTION OF LESSON

Begin this lesson by determining, with the class's help, which student will next have a birthday. Then, tell the following story about this "birthday" student and an adult the students know well, such as the principal of your school.

T: Ms. Longfeld has baked a huge birthday cake for Katie's birthday. It is a special cake. Ms. Longfeld didn't write "Happy Birthday" on it; instead she wrote a special message on the top. This is what Ms. Longfeld wrote on Katie's cake.

Write this addition story on the board, allowing the students to comment as you write.

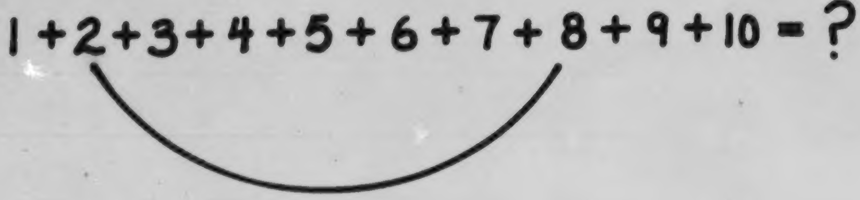
$$1+2+3+4+5+6+7+8+9+10=?$$

T: Ms. Longfeld says that we cannot share the cake until we discover what this number is.

Allow some further discussion, during which some students will probably suggest using the Minicomputer. Accept this as a good suggestion but tell the students that they would have to make many plays because there would be many checkers on the Minicomputer. Encourage the class to look for a quicker way to add these numbers. You may need to make the following suggestion yourself, but compliment any student who suggests it.

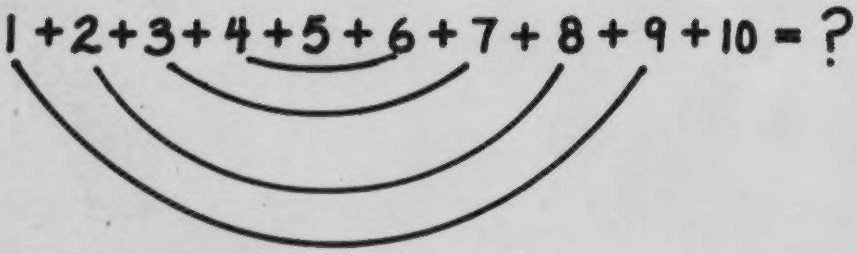
T: Here's a good idea: We could pair all of the numbers which are 10-friends, because counting by ten is easy. Among these numbers, do you see any which are 10-friends?

Accept correct suggestions and draw connecting lines between two numbers that are 10-friends. For example, suppose 8 and 2 are suggested as 10-friends.



T: 8 and 2 are 10-friends. Do you see any other 10-friends?

Continue until your picture shows these 10-friends.



Someone might suggest that a loop be drawn at 5; it is natural that the students will view this drawing as an arrow picture. If this loop is suggested, point out that there is only one 5 in this number story, and two 5's are needed to make 10.

T: Let's see how many tens we have in all.
1 + 9 = 10.

Trace the connection between 1 and 9, and write "10" on the board.

T: 2 + 8 = 10.

Trace the connection between 2 and 8, and write "+10" next to "10" on the board.

$$10 + 10$$

Continue until all four connections have been traced. Point to "10" in the original number story.

T: Here is another 10.

$$10 + 10 + 10 + 10 + 10$$

T: Is that everything?

S: No, 5 is left.

Add "+ 5 =" to your story on the board.

$$10 + 10 + 10 + 10 + 10 + 5 =$$

Many of the students may already know the answer, but solve the problem collectively before completing the number story. Point to the number story and guide the students in calculating the answer.

S 57

T: 10 + 10 = ? (20)
... + 10 = ? (30)
... + 10 = ? (40)
... + 10 = ? (50)
... + 5 = ? (55)

Complete the number story at the board and congratulate the class for solving such a long problem.

S57.2 Area #1

CAPSULE LESSON SUMMARY

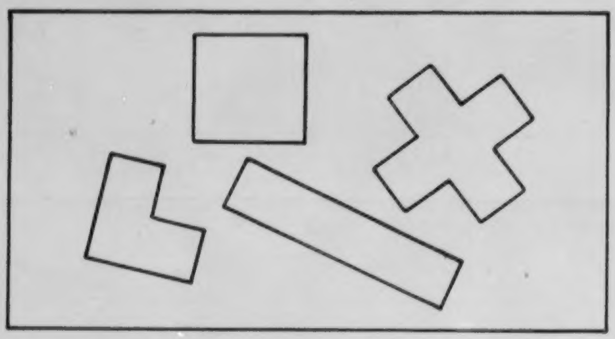
Find out how many squares of a given size are required to exactly cover various shapes.

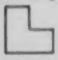
MATERIALS

Teacher:	Five cardboard squares (size: 10 cm by 10 cm); Poster #3 for First Grade, Part II; colored chalk
Student:	Worksheets S57.2* and **; ten Tangram squares

DESCRIPTION OF LESSON

NOTE: Before beginning the lesson, cut out five squares from cardboard or heavy paper, such as construction paper (size: 10 cm by 10 cm). Tape Poster #3 for FG-II to the board.



Hold up a 10 cm square (one of the 10 cm by 10 cm cardboard squares) and point to the "  " shape on the poster.

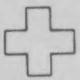
T: How many of these squares will it take to cover that shape?

Let students guess the answer and then call on a volunteer to measure the " " shape with one 10 cm square. When the class agrees that it takes three squares to cover the shape, demonstrate this with three of your cardboard squares and write "3" inside the " " on the poster.

T: That shape has an area of three of these squares.

S 57

Continue in this way for the rectangle and square shapes on the poster.

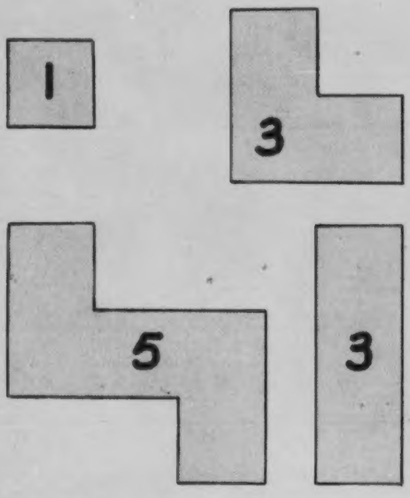
Call on a student to measure the "  " shape with one 10 cm square. Then give two students your five cardboard squares to demonstrate that five squares are needed to cover this shape. The first student, measuring with only one square, may see the area as "four squares". Tell the students that it is easy to forget to measure part of a shape when only one square is used.

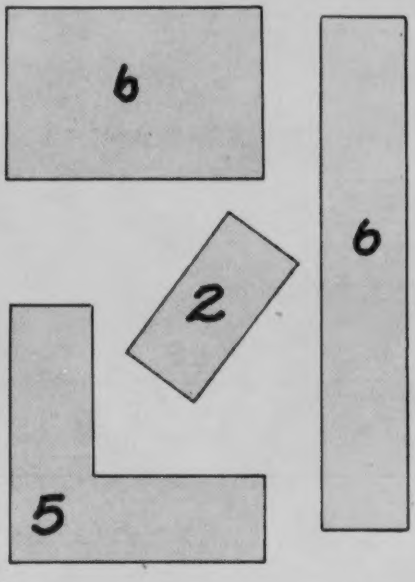
Provide each student with ten Tangram squares and a copy of Worksheet S57.2*. Instruct the students to find how many of the squares are needed to exactly cover each shape and to write the answer inside the shape. Students who have difficulty should be encouraged to actually cover each shape with Tangram squares.

Worksheet S57.2** is available for students who finish quickly.

Name ______________________ S 57.2 *

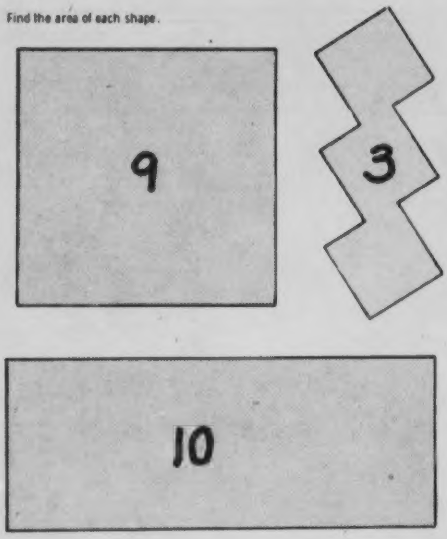
Find the area of each shape.

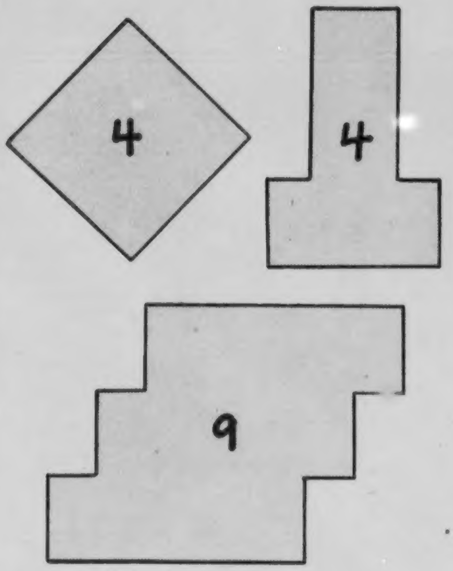




Name ______________________ S 57.2 **

Find the area of each shape.





S 58

S58.1 Addition on the Minicomputer

CAPSULE LESSON SUMMARY

Calculate "35 + 23" and "304 + 205" on the Minicomputer. Observe that these problems can be solved by adding column by column.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

T: At a school near here, the first and second graders were going on a field trip. Of course, the bus driver needed to know how many students would be going. He was told that there would be 35 first graders and 23 second graders. Can we help him figure out how many students would be going all together?

Write this problem on the board.

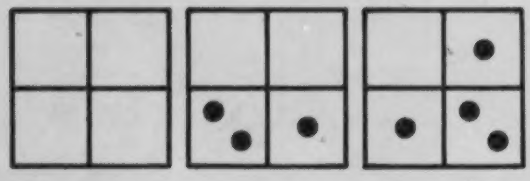
$$\begin{array}{r} 35 \\ +\,23 \\ \hline \end{array}$$

T: What number is 35 + 23? (58)

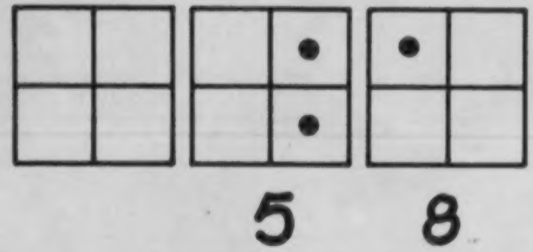
Accept several answers and record them on the chalkboard. Any students who answer correctly may be asked later how they obtained this answer.

T: Let's do the problem on the Minicomputer.

Ask one student to put 35 on the Minicomputer and another to put on 23.



Choose students to make plays and to write the answer under the Minicomputer.



Then, complete the addition problem on the chalkboard.

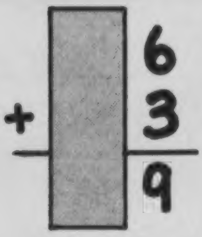
$$\begin{array}{r} 35 \\ +23 \\ \hline 58 \end{array}$$

Ask students who knew the solution earlier to explain how they found the answer. If no one thought of adding the numbers in each column separately, present a second problem such as the following one.

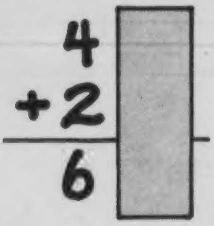
$$\begin{array}{r} 46 \\ +23 \\ \hline \end{array}$$

S 58

Before accepting answers, however, use a folded sheet of paper to cover the tens' column. Ask for the sum of 6 and 3 and write it below the ones' column.



Then, cover the ones' column and ask for the sum of 4 and 2. Write the answer below the tens' column.



Finally, remove the paper to reveal the entire problem.

$$\begin{array}{r} 46 \\ +\,23 \\ \hline 69 \end{array}$$

To check this result, repeat the calculation using the Minicomputer.

Use this same procedure to solve the following problem on the board and on the Minicomputer.

$$\begin{array}{r} 304 \\ +\,205 \\ \hline \end{array}$$

S58.2 Story Problem #3

CAPSULE LESSON SUMMARY

Draw pictures to help decide how many cartons are needed for 24 bottles if eight bottles are put into each carton.

MATERIALS

Teacher: None
Student: Paper; colored pencils

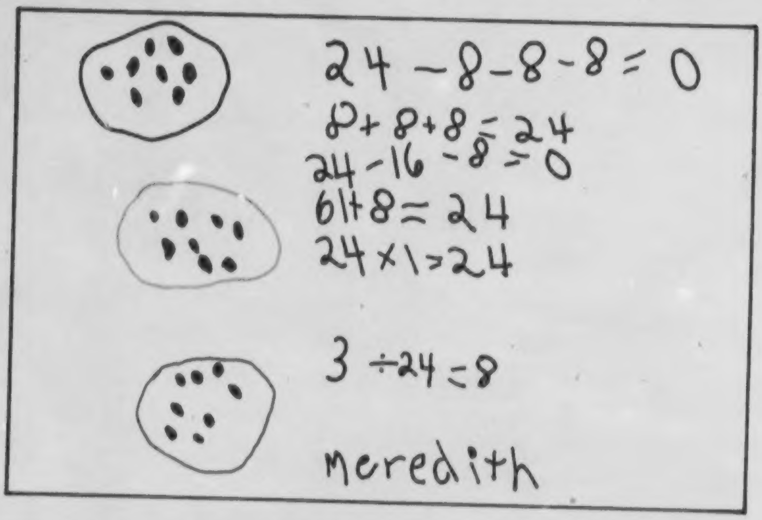
DESCRIPTION OF LESSON

T: I have 24 bottles of soda at home. I want to put them into cartons with eight bottles in each carton. How many cartons will I need? To figure out how many cartons I need, draw any kind of picture you want.

As the students begin working, do not offer any guidance, although you may want to repeat the details of the story. Students who finish quickly should be asked to write number stories about their pictures. Show several completed pictures to the class and discuss how each picture relates to the problem.

The following examples of pictures were drawn by CSMP students. One of the students, Meredith, wrote "61" for "16" and "3 ÷ 24" for "24 ÷ 3", but the rest of her work demonstrates her understanding of the problem and the number stories involved.

S 58



$24 - 8 - 8 - 8 = 0$

$8 + 8 + 8 = 24$

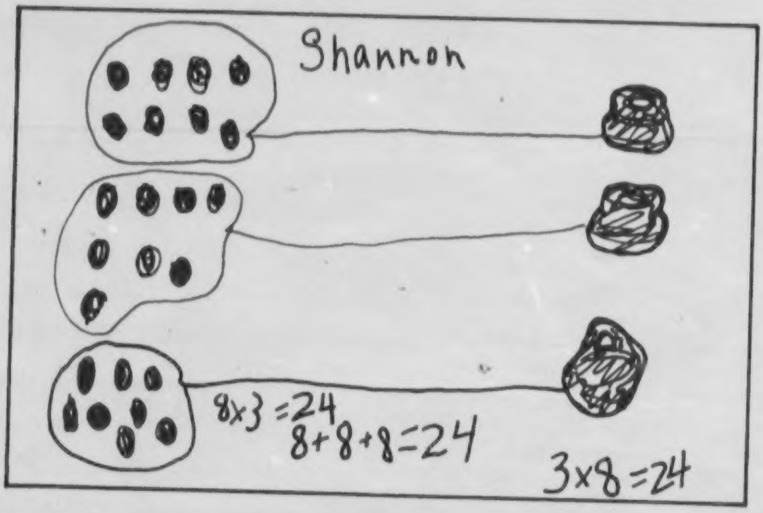
$24 - 16 - 8 = 0$

$61 + 8 = 24$

$24 \times 1 = 24$

$3 \div 24 = 8$

meredith

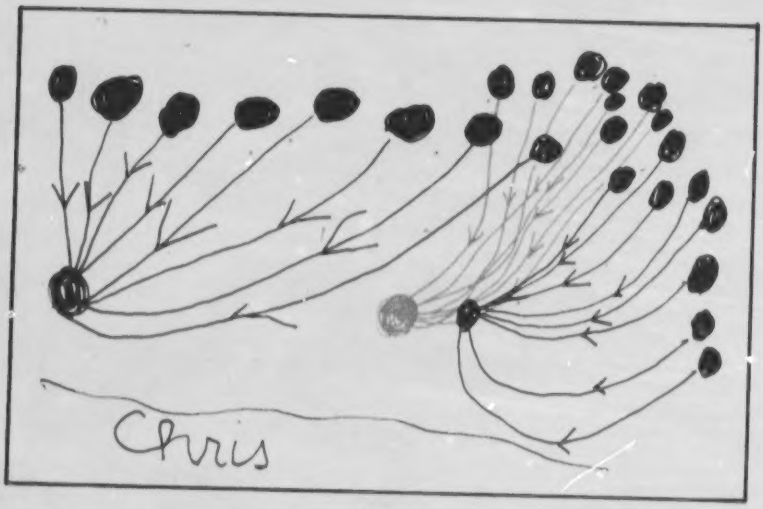


Shannon

$8 \times 3 = 24$

$8 + 8 + 8 = 24$

$3 \times 8 = 24$



Chris

S59 Consecutive Jumps on the Number Line

CAPSULE LESSON SUMMARY

Use the number line to do some addition and subtraction calculations. Make consecutive +2 jumps on the number line starting at 1 and discuss which numbers you land on if you continue. Conduct a similar activity, making some consecutive +3 jumps on the number line starting at 2.

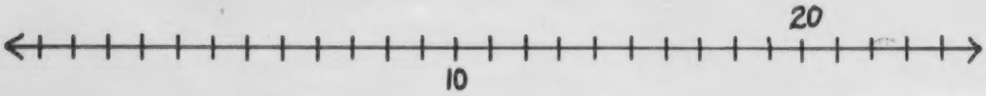
MATERIALS

Teacher: Colored chalk
Student : Worksheets S59* and **; colored pencils

DESCRIPTION OF LESSON

Draw part of the number line on the board. The graduations should be equally spaced, at least six centimeters apart.

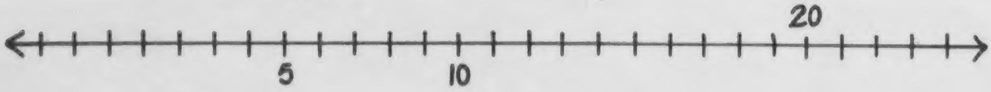
T: Here is a line with some numbers on it.



Indicate the marks to the left of 10.

T: What are some of these numbers?

Accept several suggestions from the class; then, choose a volunteer to locate 5. The student might begin counting from the left; if so, point to the last mark to the left and remind the class that they cannot be sure what number is there. Then, point to "10" and tell the class that we know this number is 10.



S 59

T: How did you know this number is 5?

S: I counted backward from 10.

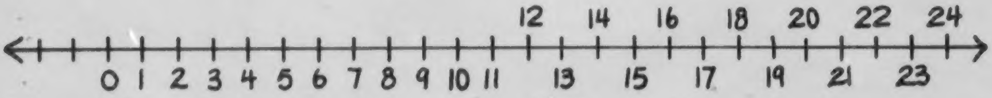
Demonstrate this, counting backward from 10 to 5 on the number line. Then, point to the position for 0.

T: What number goes here? (0) How do you know?

S: I counted backward from 5.

T: Who can show us where 15 is on this number line?

Continue this activity until all of the marks to the right of 0 have been labeled. Alternately, ask a student to identify which number is at a certain position, and to indicate the position of a certain number.



Possibly, one of the students will suggest erasing the marks to the left of 0, claiming that there are no numbers less than 0. In such a case, you should say simply, "There are many numbers less than 0, but perhaps you don't know any of them yet."* If your students are aware that negative numbers are less than 0, you may wish to label the points to the left of 0.

Distribute Worksheet S59* to the students. Point to "3" on the number line with your left hand. Ask the students to point to "3" on one of their number lines with their left hands.

---

* Of course, your students have had several lessons on negative numbers, in the context of "magic peanuts"; but do not expect them to see these numbers as being less than 0.

T: Let's calculate "3 + 5" with the help of our number lines. Use your right hand to count forward five spaces from 3.

Point to 3 on the number line with your right hand, too.

T: Now we are going to count forward five spaces.

With your right hand, point to each mark from "4" to "8" as you count aloud, "One, two, three, four, five." Your movements should be as obvious as possible.

T: What number is 3 + 5?

S: 8.

T: Let's calculate "6 + 4" with our number lines. Point to "6" with your left hand. Now we can count forward four spaces with our right hand.

Count aloud as you point to each mark from "7" to "10".

T: What number is 6 + 4?

S: 10.

Repeat this activity to calculate "9 + 7".

T: Do you think we could calculate "18 - 6" on our number lines? How?

S: Count backward six marks from 18.

T: Yes; we can subtract by going backward on our number lines. Point to "18" with your right hands. Now count backward six marks with your left hand.

Demonstrate this on the board. Point in turn to the marks from "17" to "12" as you say, "One, two, three, four, five, six."

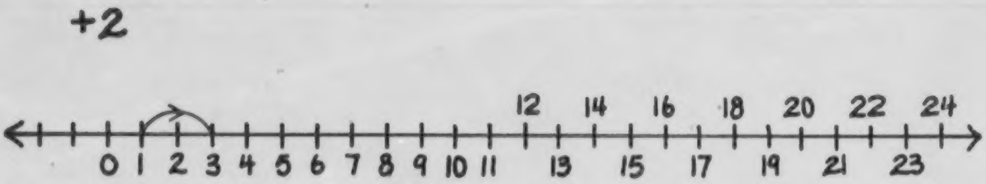
T: What number is 18 - 6?

S: 12.

Continue this activity to calculate "14 - 5" and "16 - 9".

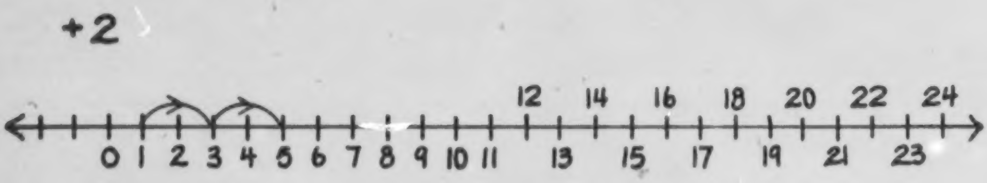
In red, write "+ 2" near your number line at the board. Draw the students' attention to the number line at the top of their worksheets.

T: We are going to start at 1 and draw + 2 arrows; use your red pencils to draw them. Who would like to draw the first + 2 arrow on the board?



The arrow can be drawn above or below the number line, but it should begin and end at the appropriate points. Take a moment to check the students' papers.

T: Let's draw another + 2 arrow, starting at 3, on this same number line. Who would like to draw this arrow on the board?



Continue this activity until the students reach 17 on their number lines.

T: What do you notice about the numbers we meet, when we start at 1 and draw + 2 arrows?

S: You land on every other number.

S: You land on all the odd numbers.

T: If we continue drawing arrows, will we ever land on 18? How do you know?

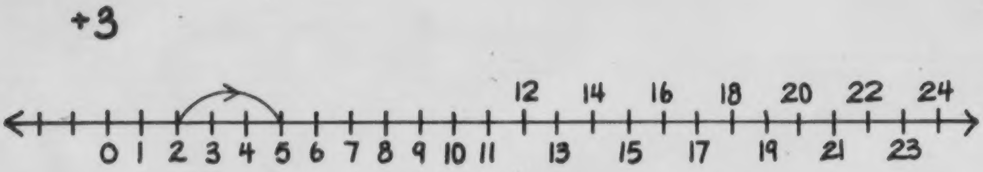
S: No; because 18 is an even number.

T: What other numbers will this + 2 arrow road land on if we keep going?

Any odd number is a correct answer. If the students understand fairly well, you may wish to ask them to name some "large" numbers that the + 2 arrow road would land on.

Ask the students to look at the second number line on their worksheets. You may wish to let a student read the instruction aloud, or read it yourself. In your drawing on the board, erase the arrows but not the number line itself. Write "+ 3" in blue near the number line.

T: We are going to start at 2 and draw + 3 arrows. Who would like to draw the first + 3 arrow on the board?



T: If we start at 2 and count over three spaces, we land on 5; 2 + 3 = 5.

Demonstrate this on the number line.

T: Start at 5 and draw another + 3 arrow.

Allow the students to continue this activity on their own. Send students who finish quickly to draw + 3 arrows on the board.

Repeat this activity with the third number line on the students' worksheets. The students should start at 1 and draw + 5 arrows. You may wish to ask the students to predict some other numbers on which the + 5 arrow road would land if the number line pictures were longer. Compliment any students who realize that the arrows will only land on numbers which end in 1 or 6 (i.e., whose ones' digit is 1 or 6).

After a while, ask the students to turn their worksheets over to look at the first number line. Invite a student to read the instructions aloud. Allow the students to work independently on this as you circulate and offer assistance where needed. Students who finish quickly can draw the arrows on the number line at the board (erase all previous arrows first). When all the arrows have been drawn you should ask the students if they notice anything interesting about the numbers on which the arrows land (the + 3 and - 3 arrows land on the same numbers). If necessary, mention this yourself.

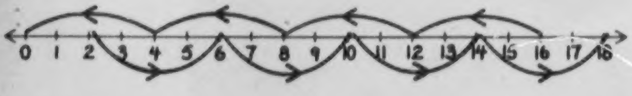
Allow the students to continue independently for the remainder of the period. As students complete the one-star worksheet, they should be given the two-star worksheet.

Name ____________________

S 59 **

Start at 2 and draw +4 arrows.

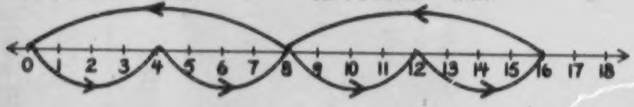
Start at 16 and draw −4 arrows.



+4 −4 −8

Start at 0 and draw +4 arrows.

Start at 16 and draw −8 arrows.

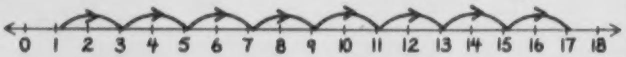


Name ____________________

S 59 *

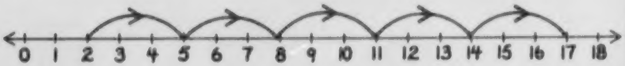
Start at 1 and draw + 2 arrows.

+2



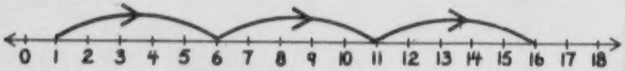
Start at 2 and draw +3 arrows.

+3



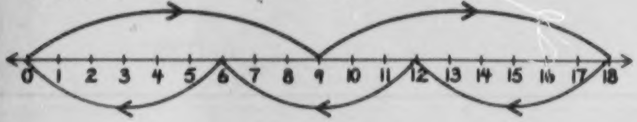
Start at 1 and draw +5 arrows.

+5



Start at 0 and draw +9 arrows.

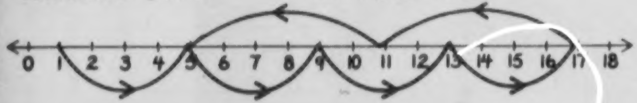
Start at 18 and draw −6 arrows.



+9 −6 +4

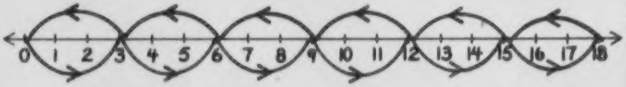
Start at 17 and draw −6 arrows.

Start at 1 and draw +4 arrows.



Start at 0 and draw +3 arrows.

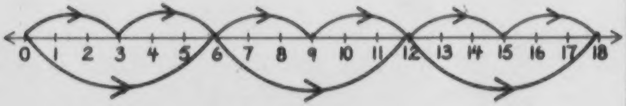
Start at 18 and draw −3 arrows.



+3 −3 +6

Start at 0 and draw + 6 arrows.

Start at 0 and draw +3 arrows.



S 60

S60 Adjustment Day #6

NOTE: See page 16, Section One NOTES TO THE TEACHER in CSMP Mathematics for the First Grade, Part I for a full explanation of the purpose of scheduled adjustment days.

On this day you may wish to repeat a previous lesson, either for a small group of students or for the entire class. Often the basic content of a particular lesson can be made to appear completely different by adjusting a story line and/or the numbers in a story. Consider the needs of your class in choosing lessons to repeat.

Exercise 1 of S48.2 Number Line Activity is a good exercise to repeat from time to time, to help students gain facility in working with the number line.

This might be a good time to repeat a version of the String Game where one region is "hatched". You can make your own adaptation of S49.1 The String Game with Two Strings #2 or see page 464 of APPENDIX: The String Game for another example of the two string variation with one hatched region.

If you omitted the worksheets from any previous lesson, you may wish to distribute them on this day, after an appropriate warm-up activity. This would also be a good time to allow the students to look at the storybook, "The Little Dreamer", if you have not already done so.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with S61.1 Length #4.

EARLY WARNING!

Among the next nine classroom lessons are some which require extra preparation time, or which make use of materials not included with the CSMP classroom set. The lessons are listed here for your convenience in preparing for them. A more detailed description of the materials can be found on the first page of each lesson. (Special materials are listed here only once, even if they are needed more often during the nine-day period.)

S61.1 Length #4: meter stick

S63.2 May Baskets: masking tape

S 61

S61.1 Length #4

CAPSULE LESSON SUMMARY

Use hands to measure a line segment which is one meter long. Compare this measurement to those made with hands of different sizes.

MATERIALS

Teacher: Meter stick
Student: None

DESCRIPTION OF LESSON

On the chalkboard, draw a line segment which is one meter long.

T: This part of a line is one meter long. Let's find out how many hands long it is from one end to the other.

Demonstrate the procedure for measuring the segment with your hands, as you did in Lesson S1.2 (p. 8), and write the result (the number of hands) on the board. Choose a student with relatively small hands and let the class see the difference in size between your hands and the student's.

T: Susan is going to see how many of her hands are in one meter. Will her measurement be more or fewer hands than my measurement?

S: More, because her hands are smaller.

Let the student measure the segment and record the number of hands.

Select another student whose hands are smaller than yours but somewhat larger than the first student's hands. Give the class another chance to observe the relative size of each person's hands.

T: Who has the biggest hands?

S: You do.

T: Who has the smallest?

S: Susan.

T: So Tom's hands are bigger than Susan's but smaller than mine. How many of Tom's hands do you think we will count?

Accept estimates, asking each student to explain. Students will probably explain that their estimates are in between the number of your hands and the number of Susan's hands. Finally, ask Tom to measure the segment and demonstrate this fact.

At a later spare moment, you may want to draw several one meter segments on the board and allow each student to determine how many of his or her hands are in one meter.

S 61

S61.2 Eli's Magic Peanuts #4

CAPSULE LESSON SUMMARY

Eli arrives home after gathering peanuts and finds that his bag contains only one peanut. Discuss what could have happened.

MATERIALS

Teacher: None
Student: Worksheets S61.2* and **

DESCRIPTION OF LESSON

T: Eli went out to gather peanuts again the other day and it seems that he still hasn't learned the difference between regular peanuts and magic peanuts.

Eli gathered peanuts all day long but when he got home and opened his bag, he found only one peanut. What could he have put in his bag that day?

S: Regular peanuts and magic peanuts.

T: How many regular peanuts and how many magic peanuts?

Accept suggestions from the class about what Eli could have put into his bag; for example,

S: Six regular peanuts and five magic peanuts.

S: Four regular peanuts and three magic peanuts.

NOTE: Some students may suggest combinations that leave one magic peanut; e.g., three regular peanuts and four magic peanuts. Such combinations are correct as well, but if none of them is suggested, do not force the class to consider them.

After several correct suggestions have been offered, continue.

T: Suppose Eli put in five regular peanuts but found only one peanut in the bag at the end of the day. How many magic peanuts could he have put into the bag?

S: Four.

T: Five regular peanuts and four magic peanuts would leave one peanut --- a regular one. Does anyone know another possibility?

Six magic peanuts is another possible solution (leaving one magic peanut), but do not insist that the students discover this.

T: Suppose Eli put in ten magic peanuts but found only one peanut in his bag at the end of the day? How many regular peanuts could he have put into the bag?

Again there are two possibilities (eleven and nine), but the class may not recognize both possibilities.

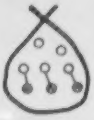
Distribute copies of Worksheet S61.2* and explain that they contain some stories about Eli, but that part of each story is missing. The students should complete each story.

When students complete this worksheet, give them Worksheet S61.2**.

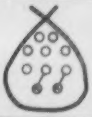
Name ____________ **S 61.2 ***

Complete.

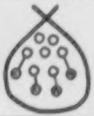
$5 + \hat{3} = \boxed{2}$



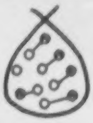
$8 + \hat{2} = \boxed{6}$



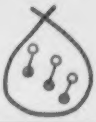
$7 + \hat{4} = \boxed{3}$



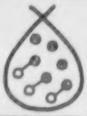
$\hat{5} + 6 = \boxed{1}$



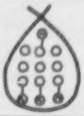
$\hat{3} + 3 = \boxed{0}$



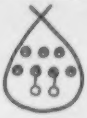
$3 + \hat{6} = \boxed{\hat{3}}$



$\hat{4} + 9 = \boxed{5}$



$2 + \hat{7} = \boxed{\hat{5}}$



Name ____________ **S 61.2 ****

Complete.

$6 + 4 = \boxed{10}$

$\hat{3} + \hat{2} = \boxed{\hat{5}}$

$14 + \widehat{11} = \boxed{3}$

$\widehat{23} + 20 = \boxed{\hat{3}}$

$10 + \boxed{\hat{3}} = 7$

$\hat{3} + \boxed{8} = 5$

$106 + \boxed{\hat{6}} = 100$

$\widehat{50} + \boxed{\widehat{12}} = \widehat{62}$

S62.1 Minicomputer Introduction #2

CAPSULE LESSON SUMMARY

Practice putting and reading four-digit numbers on the Minicomputer.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

This lesson should be short (about ten minutes) and brisk.

T: Who would like to put a "secret" number on the Minicomputer?

Select a volunteer and whisper your "secret" number to the student. (Choose a number which is in the thousands but whose difficulty is appropriate for each student; 1,000, 2,000, 4,000, and 8,000 are the easiest numbers . . . the most difficult are those which require checkers on all four boards.) Be sure to include numbers with 0 as the tens' or hundreds' digit.

When the first student has put the number on the Minicomputer, ask a second student to write the numeral under the Minicomputer boards and a third student to read the number. Then, ask the first student if that, indeed, is the secret number.

Repeat this activity three or four times with other secret numbers and new volunteers.

S 62

S62.2 +1, +2, +3, +6 Arrow Picture

CAPSULE LESSON SUMMARY

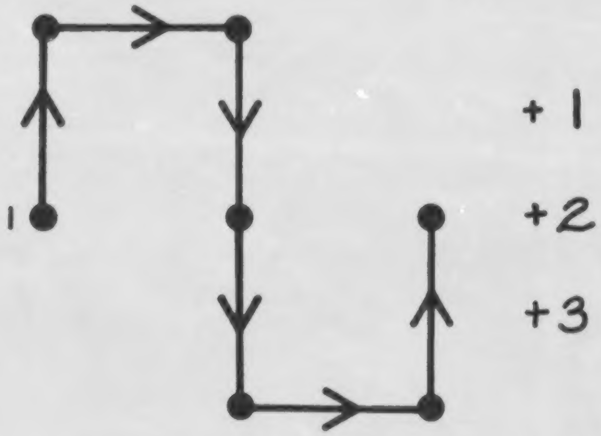
Label the dots in an arrow picture which has +1, +2, and +3 arrows. Then draw +6 arrows between numbers already in the picture.

MATERIALS

Teacher:	Colored chalk
Student:	Colored pencils; Worksheets S62.2* and **

DESCRIPTION OF LESSON

Draw this arrow picture on the board.

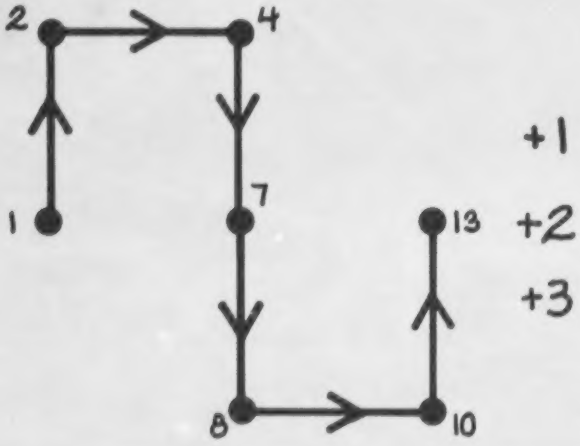


Call on students to label dots, each time checking the number by tracing the arrow leading to that dot; for example,

T: 1 (point to the first dot) plus 1 (trace the green arrow) is 2 (point to the second dot).

If a student labels a dot whose preceding dot has not been labeled, say simply that it might be correct and that you will check when more dots are labeled.

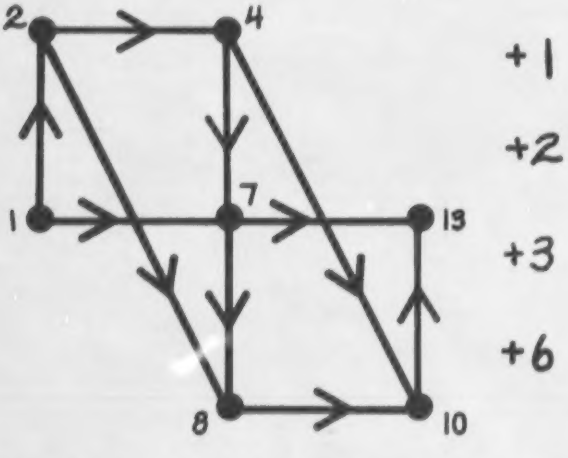
Continue until all of the dots in the picture have been labeled.



In a fourth color, write "+6" near the arrow picture.

T: Who can show us where to draw a +6 arrow?

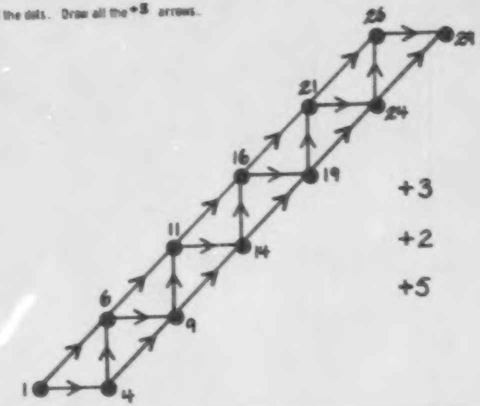
There are four +6 arrows that may be drawn in this picture. Call on students to draw them (or trace them with their fingers). Each time an arrow is drawn, check it by tracing the arrow and telling the corresponding number story. The completed picture is shown below.



Worksheets S62.2* and ** are available for individual work. Explain to the students that they should label the dots and then draw green arrows for +5.

Name________________

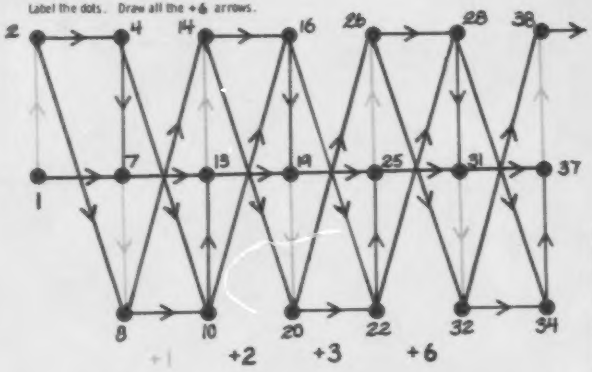
Label the dots. Draw all the +3 arrows.



S 62.2 *

Name________________

Label the dots. Draw all the +6 arrows.



S 62.2 **

S63.1 Addition Activity

CAPSULE LESSON SUMMARY

Do mental arithmetic sequences such as:

$$2 + 4 = 6$$
$$20 + 40 = 60$$
$$21 + 40 = 61$$

MATERIALS

Teacher: None
Student: Paper; pencil

DESCRIPTION OF LESSON

This activity should be conducted briskly. Although the students will be asked to write down some of the problems, try to maintain a pace similar to that of mental arithmetic activities.

Hold up two fingers of one hand and four fingers of the other hand.

T: What number is 2 + 4?

S: 6.

T: 2 + 4 = 6. What number is 20 + 40? (60)
How do you know?

S: 2 + 4 = 6; so 20 + 40 = 60.

T: 20 + 40 = 60. What number is 21 + 40?
Write this problem on your papers and solve it.

As the students work, write the addition problem on the board.

$$\begin{array}{r} 21 \\ +40 \\ \hline \end{array}$$

S 63

When you observe several students with the correct answer, ask one of them to complete the number story on the board.

$$\begin{array}{r} 21 \\ +40 \\ \hline 61 \end{array}$$

T: Yes; 21 + 40 = 61. How do you know?

Allow the student to explain but be prepared to help with the verbalization. Ask if anyone used a different method and can explain it to the class.

Repeat this activity with the following sequences of calculations or any similar ones which are appropriate for your class.

5 + 3 =
50 + 30 =
50 + 32 =

3 + 4 =
30 + 40 =
30 + 43 =

3 + 2 =
30 + 20 =
35 + 20 =

5 + 4 =
50 + 40 =
56 + 40 =

S63.2 May Baskets

CAPSULE LESSON SUMMARY

Discuss an arrow picture in which the arrows are for "I gave you a May basket". Draw individual "May basket" pictures.

MATERIALS

Teacher: Poster #4 for First Grade, Part II; tape

Student: Paper; colored pencils

DESCRIPTION OF LESSON

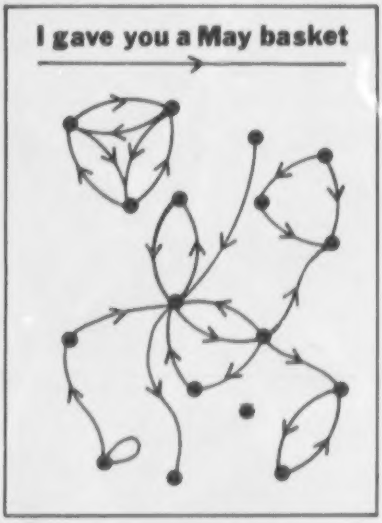
Tell the following story to your class.

T: I have a friend named Michael who lives in a small town in Kansas. Every year Michael and some of his friends prepare May baskets for May Day. Do you know when May Day is and what May baskets are?

May Day is May 1st and is celebrated to welcome Spring. It is the custom in some communities to have a Maypole or for young people to make May baskets for their friends. The May baskets are usually small open baskets with a handle, filled with Spring flowers and perhaps a few sweets. A basket is left on a friend's doorstep after dusk on April 30th to be discovered when the friend opens the door the next morning.

T: Michael drew this picture about May Day in his town.

Tape the FG-II Poster #4 to the board.



T: The dots are for children in Michael's neighborhood. What are the red arrows for?

S: "I gave you a May basket."

T: What do you think about Michael's picture?

Allow the students to comment spontaneously, even if their remarks are not directly related to the meaning of the arrow picture. Your students might make some of the following remarks.

S: It's a very complicated picture.

S: I think it's pretty.

S: There are many arrows.

S: It looks funny.

S: I see someone who gave a lot of May baskets.

Ask this last student to point to the dot of a child who gave many May baskets. Illustrate this kind of comment by tracing all of the arrows which begin at the dot. Mention that each child who gave a May basket is at the beginning of an arrow and that each child who receives a May basket is at the end of an arrow.

S: I see a child who gave four May baskets.

Ask this student to point to that dot and to trace the four arrows starting at that dot.

S: I see a child who didn't receive any May basket.

Ask this student to point to that dot and to show that no arrows end at that dot.

Allow the discussion to continue for a while if the students remain interested. Encourage a variety of observations. You may also wish to guide the discussion by asking questions of your own.

T: Michael told me that he gave the most May baskets. Where is Michael? How many May baskets did he give?

S: Four.

Have a student point to Michael's dot; label this dot "Michael".

T: Can you find a child who gave exactly one May basket and received exactly one May basket?

Encourage the students to find several such children.

T: Michael's friend Peggy received the most May baskets. Where is Peggy? How many May baskets did she receive?

S: Five.

Call on a student to point to the dot for Peggy; label this dot "Peggy".

T: Find pairs of children who gave May baskets to each other.

There are several such pairs; encourage the class to find them all.

T: What do you think about the child with the loop?

S: He gave a May basket to himself.

T: How many May baskets were given all together? (24)
How many May baskets were received all together? (24)

S 63

T: Which child would you like to be? Why?

Use your own judgement about which questions are the most appropriate for your class and how much time should be devoted to this part of the lesson. These decisions depend on the language abilities of your students and on their interest in the story.

Provide the students with unlined paper and colored pencils. Ask them to draw their own pictures of a May basket story.

T: Draw and label a dot for yourself in the middle of your paper. Then draw a May basket story about yourself. Give a May basket to at least four people.

Encourage students to write "I gave you a May basket" on their papers. You will probably receive many different arrow pictures. Show some of them to the class and let the students comment briefly.

S 64

S64.1 1/2 × on the Minicomputer #2

CAPSULE LESSON SUMMARY

Decide how a farmer can share his animals equally between his two children.

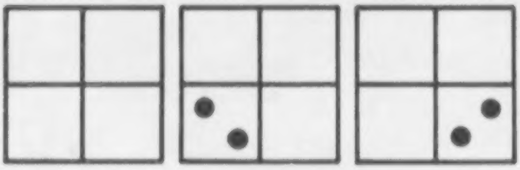
MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

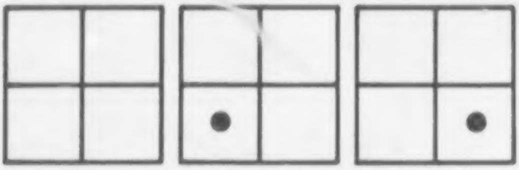
T: There was once a farmer who was getting ready to retire; he decided he didn't want to farm anymore. He had two children and wanted to give half of his cattle to each child. Let me show you how many cows he had.

Put this configuration on the Minicomputer.



T: How many cows? (42) Who can take away half of the cows?

Choose a volunteer to take away half of 42. The student should remove one checker from the 20-square and one checker from the 1-square. (If any other checkers are removed, ask how many cows are left and how many were removed; this should lead the class to see that the cows were not shared evenly.



T: How many cows did each child receive?

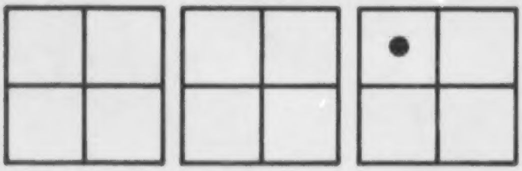
S: 21.

Write a number story for this on the board.

$$\frac{1}{2} \times 42 = 21$$

T: The farmer also had eight horses to share between his two children.

Put this new number on the Minicomputer.



T: Who would like to take away half of the horses?

S: We can't; there aren't two checkers.

S: We need to make a backward play.

Invite a student to make the "8 = 4 + 4" play, and call on another student to take away half of 8.

T: How many horses did each child receive?

S: Four.

Write the corresponding number story on the board.

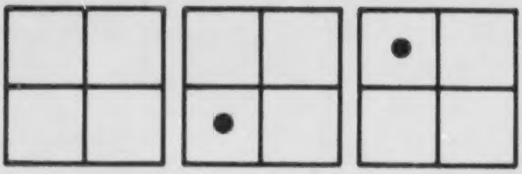
$$\frac{1}{2} \times 8 = 4$$

T: The farmer also had 28 pigs. If each of his two children were to get half of them, how many pigs would each child get? (14)

This time, write the problem on the board first.

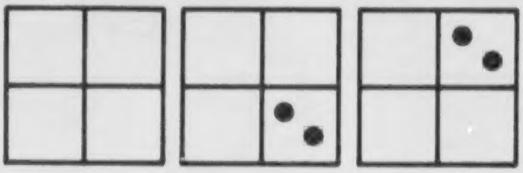
$$\frac{1}{2} \times 28 =$$

Accept guesses from the class and record them on the board. Then call on a student to put 28 on the Minicomputer.



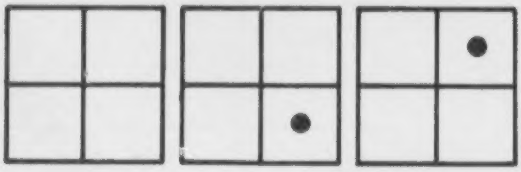
T: Who can take away half of the 28 pigs?

S: We need to make some backward plays first.



T: Can anyone take away half of the pigs now?

Choose a volunteer to do so.



T: How many pigs did each child get?

S: 14.

Complete the number story at the board.

$$\frac{1}{2} \times 28 = 14$$

If someone had known this answer earlier, ask for an explanation. A good explanation would be: $\frac{1}{2} \times 20 = 10$ and $\frac{1}{2} \times 8 = 4$, so $\frac{1}{2} \times 28 = 14$. Do not be concerned, however, if this explanation is not offered or is not well-phrased.

Repeat this process to share 242 chickens. First write the problem ("$\frac{1}{2} \times 242 =$"), ask for guesses, and then solve the problem on the Minicomputer. Once again, encourage students who guess correctly to later explain how they obtained their answer.

S64.2 "Is Less Than" Relation #2

CAPSULE LESSON SUMMARY

Draw "I am less than you" arrows between labeled dots. Nonstandard names are given for the numbers in the picture.

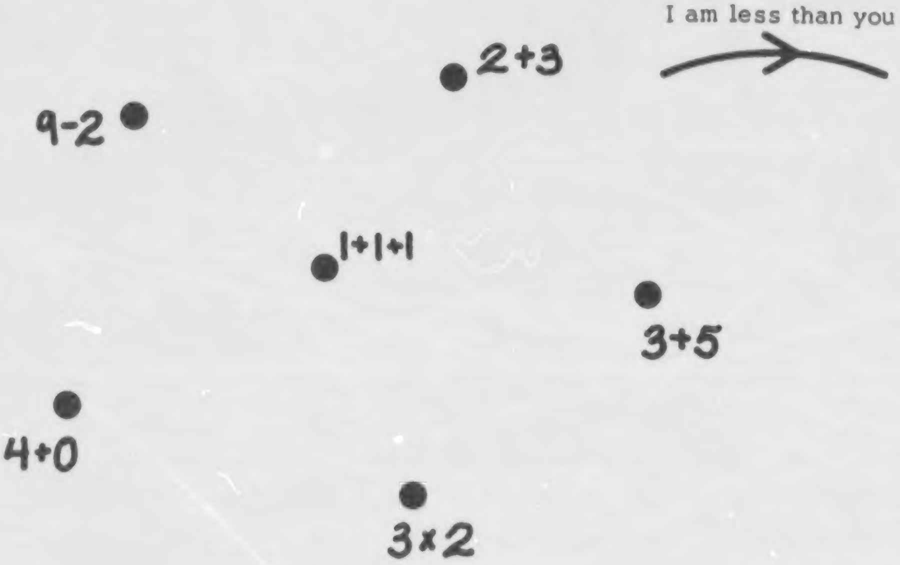
MATERIALS

Teacher: Colored chalk

Student : Paper ; colored pencils

DESCRIPTION OF LESSON

Draw this picture on the board.



T: Which is the smallest number in this picture?

Encourage students to do the calculation mentally, to find standard names and to check the answer. The class should conclude that 1 + 1 + 1 (i.e., 3) is the smallest number.

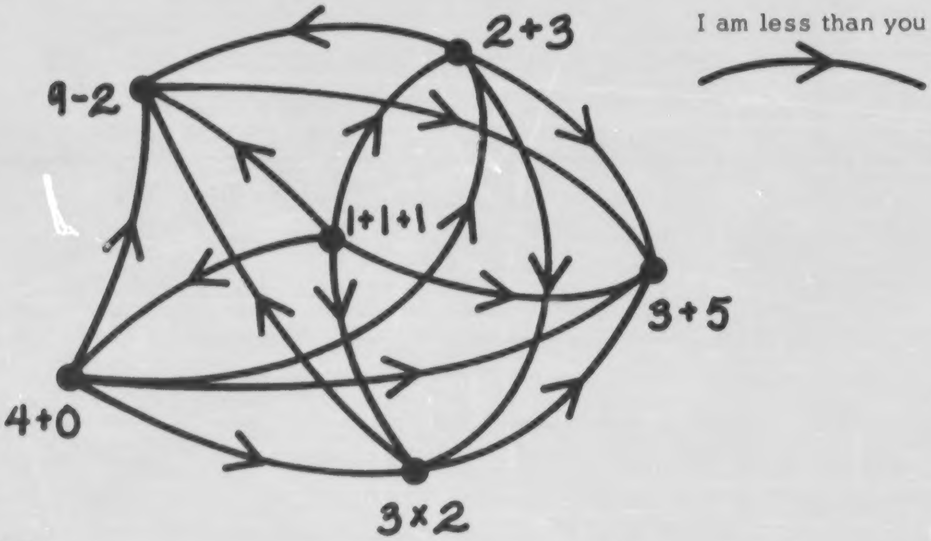
T: Which is the largest number in this picture?

S 64

Again, encourage mental calculations to find standard names and to check the answer. The class should conclude that 3 + 5 (i.e., 8) is the largest number.

T: Copy this picture on your papers and draw all the arrows you can for "I am less than you".

For your reference, the completed picture is shown below.



Encourage the students to draw the dots spread out on their papers. Do not expect or insist that students draw all possible arrows.

S65.1 Mystery Arrows

CAPSULE LESSON SUMMARY

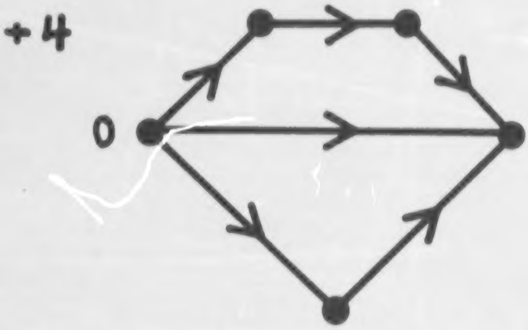
Given an arrow picture in which red arrows are for + 4 and only one dot is labeled, decide what the blue arrows and the green arrows are for, and label the other dots.

MATERIALS

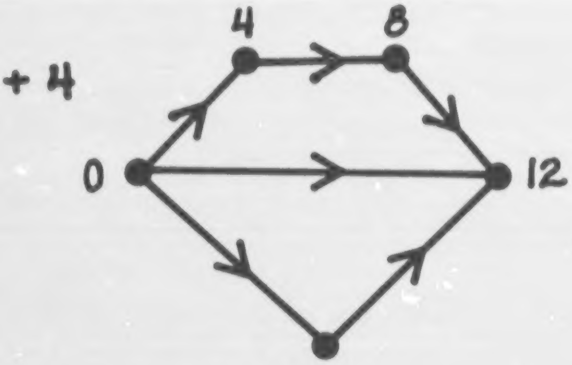
Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



Invite volunteers to label the dots. At this point, of course, you would only expect dots connected by red arrows to be labeled. If a student labels the bottom dot ask, "How do you know that this number is ______?" The students should agree that it would be best to wait until they learn what a green arrow is for before labeling that dot. When the four upper dots have been labeled, continue.



S 65

T: What could the blue arrow be for? How do you know?

S: +12, because 0 + 12 = 12.

NOTE: The blue arrow could also be for "I am less than you", or "You are more then me." If this is suggested, respond that this is correct but here the blue is for something else.

Write "+12" in blue near the arrow picture.

T: What could the green arrows be for? How do you know?

It may be difficult for your students to explain why they think the green arrows are for +6. If +6 is not suggested, you may need to guide the discussion as follows.

T: We go from 0 to 12 with two green arrows.

S: The green arrows could be for +10 and +2.

T: 10 + 2 = 12; however, both green arrows are for the same thing.

S: The green arrows could be for +5.

T: 0 + 5 = . . . ? (5) 5 + 5 = . . . ? (10)
But this dot is for 12, so the green arrows can't be for +5. With +5, the ending number is not large enough.

S: They could be for +6.

T: 0 + 6 = . . . ? (6) And 6 + 6 = . . . ? (12)
Yes; the green arrows are for +6.

Ask a volunteer to label the lower dot ("6") before concluding the lesson.

S65.2 Individual Minicomputers #1

CAPSULE LESSON SUMMARY

Do addition and subtraction calculations on individual Minicomputers.

MATERIALS

Teacher: Minicomputer set
Student: Minicomputer set

DESCRIPTION OF LESSON

Give each student two Minicomputer boards (one Minicomputer sheet) and several checkers. Try to keep the pace of this activity brisk, offering assistance as needed. Allow some time for the students to perform each calculation on their Minicomputers; then, send a student to perform the calculation on the demonstration Minicomputer.

Exercise 1

Give the instructions for this exercise verbally.

T: Put 23 on your Minicomputers.

Invite a student to put 23 on the demonstration Minicomputer.

T: Add 14 to the number on your Minicomputers.

Ask a student to add 14 to the number on the demonstration Minicomputer.

T: What number is 23 + 14? (37)
Calculate 37 - 10 on your Minicomputers.
What number is 37 - 10? (27)

S 65

Continue the activity with the following sequence of subtraction calculations.

27 - 2
25 - 20
5 - 0
5 - 5

Exercise 2

Write each calculation in this exercise horizontally on the board.

T: Calculate "42 + 34" on your Minicomputers.

42 + 34 =

Send a student to calculate "42 + 34" on the demonstration Minicomputer.

T: What number is 42 + 34? (76)

Complete the number story at the board. Continue the activity with this sequence of subtraction problems.

76 - 20
56 - 4
52 - 12
40 - 20 (a backward play is needed)
20 - 20

Exercise 3

Write each calculation in this exercise vertically on the board. Ask students to predict an answer before doing the calculation on their Minicomputers, but do not record these predictions on the board.

$$\begin{array}{r} 45 \\ +14 \\ \hline \end{array}$$

T: Don't do anything on your Minicomputers yet. What number is 45 + 14?

Allow the students to predict the answer.

T: Now let's do this calculation on our Minicomputers. Add 45 and 14.

Send a student to add 45 and 14 on the demonstration Minicomputer.

T: What number is 45 + 14? (59)

Complete the number story on the board and then continue the activity with the following sequence of subtraction problems.

$$\begin{array}{r} 59 \\ -11 \\ \hline \end{array} \qquad \begin{array}{r} 48 \\ -40 \\ \hline \end{array} \qquad \begin{array}{r} 8 \\ -4 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ -4 \\ \hline \end{array}$$

Exercise 4

If your class remains interested, continue with the more difficult activity which follows. Write each calculation in this exercise vertically on the board. Again ask students to predict an answer before doing the calculation on their Minicomputers.

T: What number is 26 + 31?

$$\begin{array}{r} 26 \\ +31 \\ \hline \end{array}$$

S 65

Allow the students to predict the answer.

T: Add 26 and 31 on your Minicomputers.

Send a student to add 26 and 31 on the demonstration Minicomputer.

T: What number is 26 + 31? (57)

Compliment any students who had correctly predicted the answer and ask them to explain how they obtained it. Complete the number story on the board.

Follow a similar method to solve the following sequence of subtraction problems.

$$\begin{array}{r} 57 \\ -14 \\ \hline \end{array} \qquad \begin{array}{r} 43 \\ -20 \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ -0 \\ \hline \end{array} \qquad \begin{array}{r} 23 \\ -23 \\ \hline \end{array}$$

S66.1 Three Strings #3

CAPSULE LESSON SUMMARY

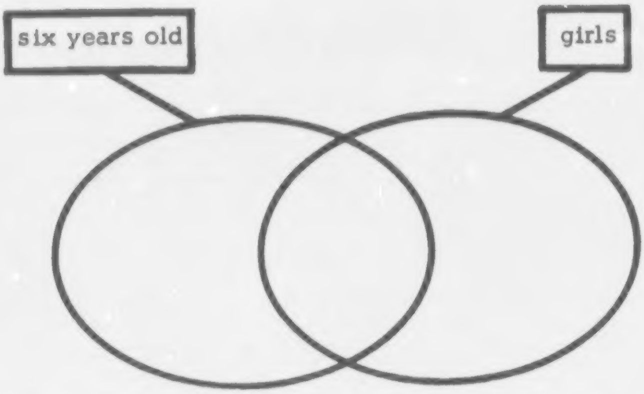
Draw a string picture in which one string is for six year olds, one string is for girls, and one string is for seven year olds. Describe children in terms of these characteristics and put dots in the picture for them. Find and hatch an empty region in the picture.

MATERIALS

Teacher: Colored chalk
Student: None

DESCRIPTION OF LESSON

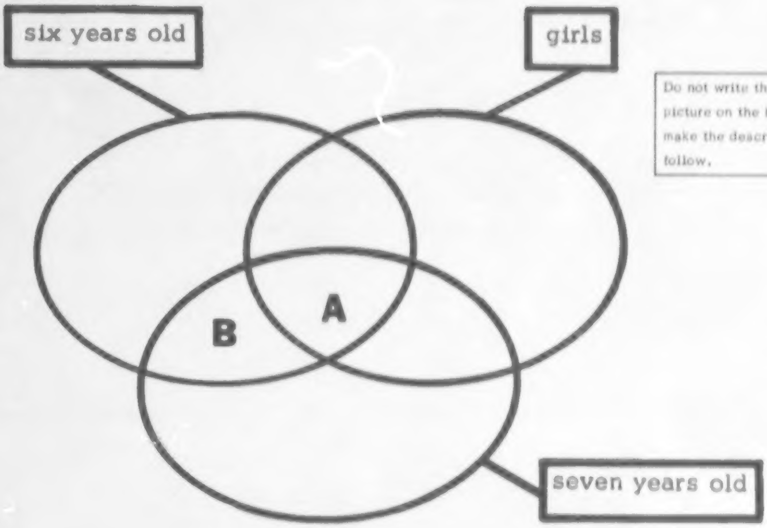
Draw this string picture on the board.



T: The red string is for all children who are six years old and the blue string is for all children who are girls.

Call on several students to show where they would draw a dot for themselves and discuss with the class whether or not each dot is placed correctly. Add a third string to your drawing, as shown in the next illustration.

S 66



Do not write the capital letters in your string picture on the board. They are here just to make the description of the lesson easier to follow.

T: The green string is for all children who are seven years old.

Point to each of the eight regions in turn and ask someone to describe who could be there (point to the regions labeled "A" and "B" last).

T (pointing to region A): Who could be here?

S: A girl who is six years old and seven years old.

S: You can't be six and seven.

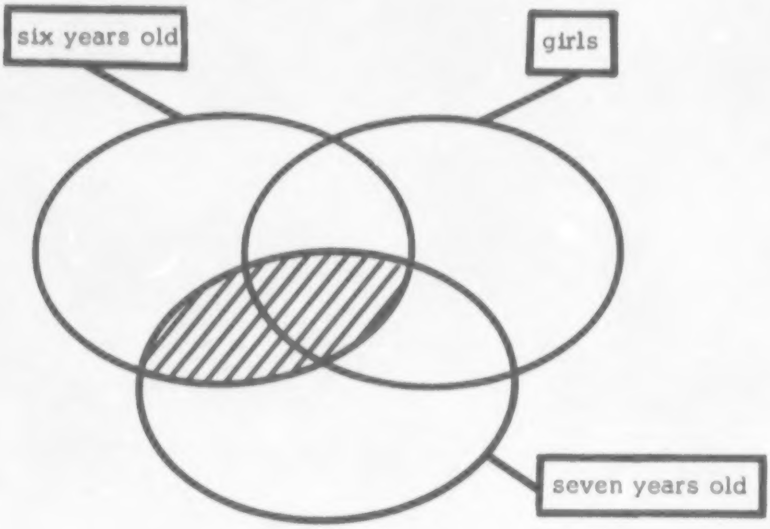
S: Nothing can go there!

T (pointing to region B): Who could be here?

S: Nothing is there, either.

T: How can we show that nothing can go here (A) or here (B)?

You may need to remind the class about how hatching is used to show that a region is empty. Ask a volunteer to add the hatching to the string picture.



T: I'm thinking of a child I know and I would like you to draw a dot for that child in our picture. You may ask me questions about the child, but I will answer only "yes" or "no".

Answer questions about the child you have chosen until the class has enough information to place the dot; then ask someone to draw it in the string picture.

Repeat this activity several times, perhaps allowing a student to think of someone and answer questions; in this case, let the student describe the child to you first so that you can check the student's answers to questions.

S66.2 Frogs in a Pond #2

CAPSULE LESSON SUMMARY

Find common multiples of 6 and 4 in the context of a story. Two frogs start at the first of a long line of lily pads. The large frog jumps six pads at a time; the small frog jumps four pads at a time. On which pads will they meet?

MATERIALS

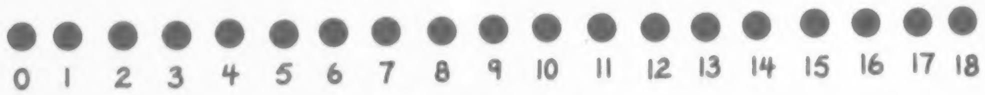
Teacher: Colored chalk

Student: Worksheet S66.2; colored pencils

DESCRIPTION OF LESSON

T: Several weeks ago we talked about two frogs who lived in a big pond; they hopped on numbered lily pads which stretched from the shore far out into the middle of the pond.

Draw this picture on the board.

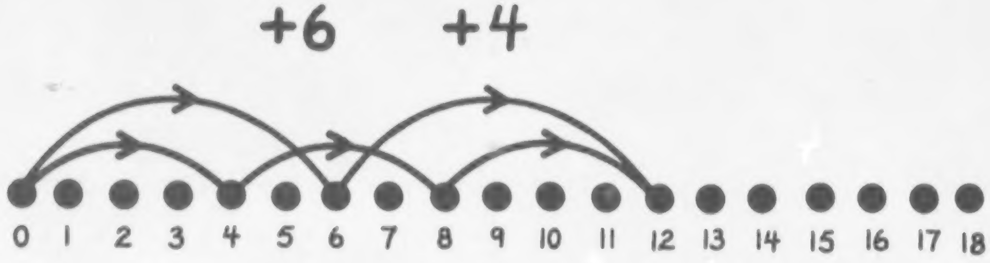


T: The lily pad "0" is next to the shore and the pads go on and on; I've only drawn some of them. Both frogs have grown a little since we last saw them. The big frog now hops six pads at a time, while the little one hops four pads at a time.

Near your picture, write "+6" (in red) and "+4" (in blue).

T: They are both sitting at "0" and are going to hop out toward the middle of the pond. What do you think is the number of the first pad they will both land on so they can eat lunch together?

Accept several guesses and then ask students to draw red and blue arrows for the frogs' hops. Direct this activity toward finding a meeting place for the frogs. For example, the students might first draw a blue arrow (from 0 to 4), then a red arrow (from 0 to 6), then another blue arrow (from 4 to 8), then another red arrow (from 6 to 12), and finally a blue arrow (from 8 to 12).



Compliment any students who predicted this answer and ask for an explanation.

T: Suppose the frogs decide to go farther out into the pond . . . where do you think they will meet next? (At "24")

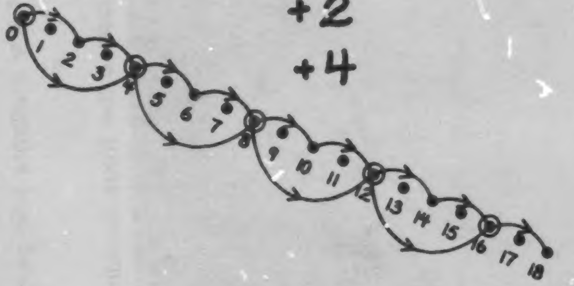
You may wish to ask the class for the number of the frogs' third meeting place. (36)

Distribute copies of Worksheet S66.2. Explain that on the front side of this worksheet, one frog hops two pads at a time and the other frog hops four pads at a time. After showing the frogs' hops (with arrows), the students should circle the pads on which the frogs could meet. Similar instructions apply for the reverse side of the worksheet, except that here one frog hops two pads at a time and the other frog hops three pads at a time.

Ask students who finish quickly to list other pads where the frogs could meet, if they continue to hop farther out into the pond.

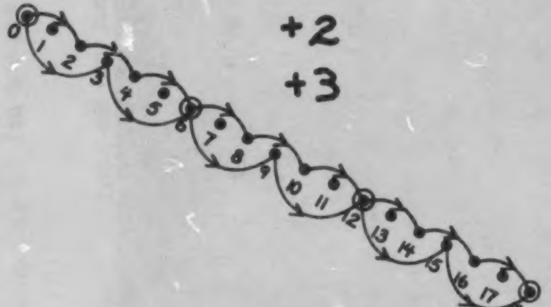
Name ____________________

S 66.2



+2

+4



+2

+3

S67.1 Eli is Tricked

CAPSULE LESSON SUMMARY

Clarence the Crafty Crocodile plays a trick on Eli while Eli is sleeping: Eli awakes to find some of his peanuts missing. Discuss what Clarence could have done.

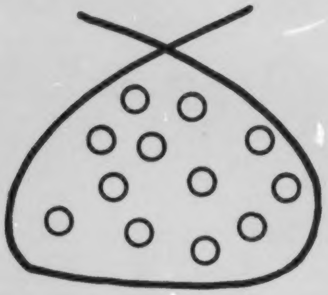
MATERIALS

Teacher: None
Student: None

DESCRIPTION OF LESSON

T: One day Eli was walking in the jungle and carrying twelve regular peanuts in his bag.

On the board, draw Eli's bag of peanuts.



T: Eli walked a long time and became very tired, so he decided to take a nap. As soon as he fell asleep, along came Clarence the crafty crocodile. Clarence saw that Eli was asleep and decided to play a trick on him. He opened Eli's bag and did something sneaky, but I won't tell you what. He closed Eli's bag then and quietly went away.

When Eli awoke, he was hungry and opened his bag. He counted his peanuts and discovered that he had only eight regular peanuts. How many peanuts were missing?

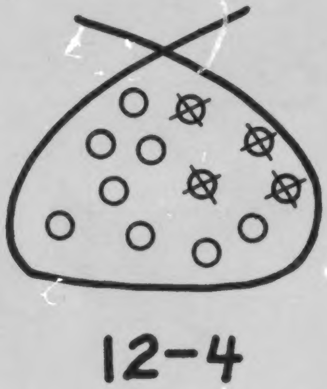
S: Four.

T: Yes, four peanuts were missing. What trick do you think Clarence played on Eli?

Allow some time for discussion of this problem. Two possible explanations should emerge, one of which involves taking away some peanuts.

S: Clarence took four peanuts out of Eli's bag.

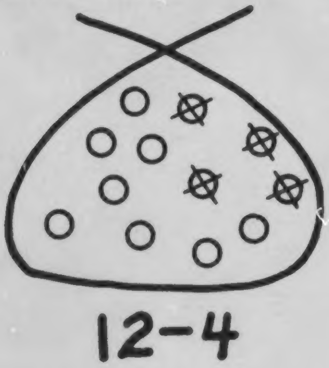
On your picture, cross out four peanuts and write the subtraction calculation below the bag.

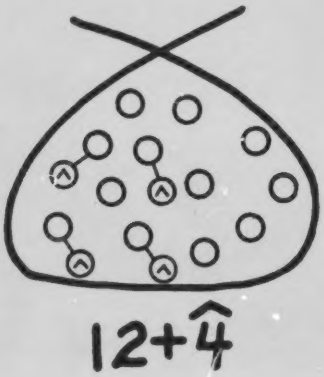


A second possibility involves adding some magic peanuts.

S: Clarence put four magic peanuts into Eli's bag.

Draw a second bag of peanuts (beside the first one), draw the four magic peanuts, and pair magic peanuts with regular peanuts. Write the addition calculation below the bag.





During the discussion, a student might also suggest, for example, that Clarence took out three regular peanuts and put in one magic peanut. Compliment any student who suggests such a combination, but explain that Clarence only had enough time to either put peanuts in or take them out --- not both.

T: Even if Eli knew about magic peanuts, could he tell which of these things Clarence did: put in four magic peanuts, or take out four regular peanuts?

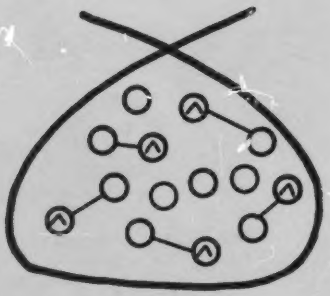
S: No.

T: That's right; both tricks leave the same number of regular peanuts.

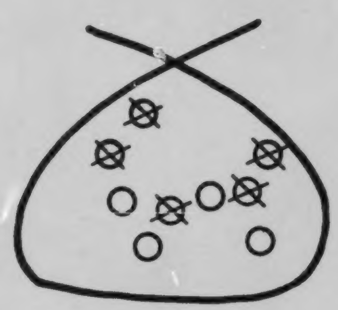
Complete a number story for this equality.

$$12+\widehat{4}=12-4=8$$

Tell a similar story about another day when Eli fell asleep with nine regular peanuts and awoke to discover that five were missing. For your reference, two pictures and the resulting number story are illustrated below.



$9+\widehat{5}$



$9-5$

$$9-5=9+\widehat{5}=4$$

S67.2 Introduction to "A Parade of Problems #3"

CAPSULE LESSON SUMMARY

Provide individual practice with the Minicomputer, arrow pictures, counting problems, string pictures, and so on.

MATERIALS

Teacher: None
Student: "A Parade of Problems #3" workbook; colored pencils

DESCRIPTION OF LESSON

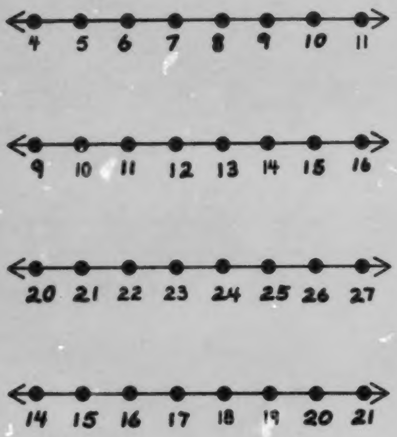
Distribute copies of "A Parade of Problems #3" and allow students to work at their own rate. Circulate among the students to give individual help where it is needed. Encourage the students to work carefully and to check their work.

Allow about twenty minutes for this independent work. Because pages of the workbook increase in difficulty as the students progress through them, some students will naturally complete more pages than will others. There should be enough exercises to challenge even your brightest students.

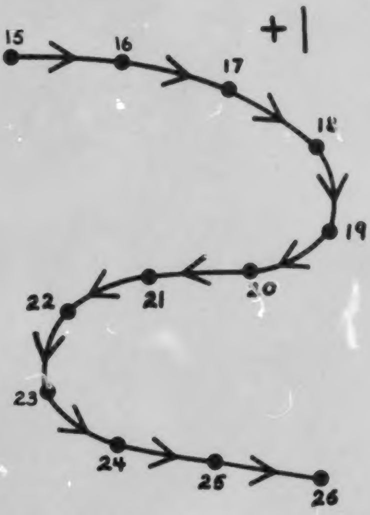
A second lesson is scheduled for this workbook so collect the workbooks at the end of the period. Check them and have them ready for use again in Lesson S77.2. (See the discussion about workbooks in Section One, NOTES TO THE TEACHER, pp. 10-13, of CSMP Mathematics for the First Grade, Part I, Teacher's Guide.)

A Parade of Problems 3

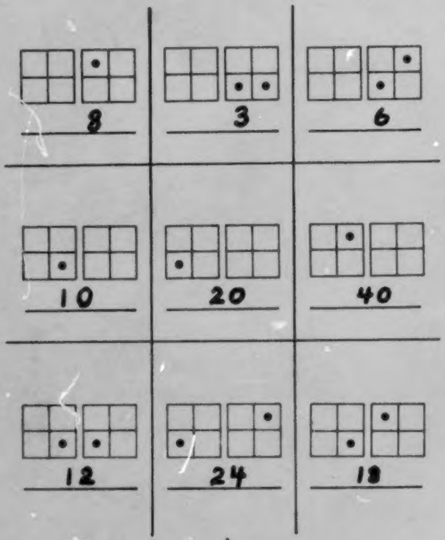
Label the dots on these number lines.



Label the dots.



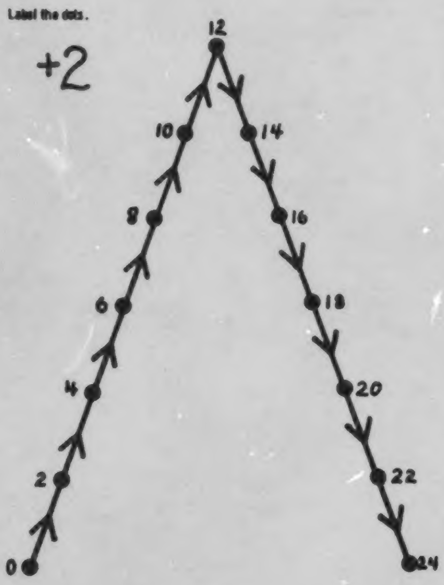
What number is on the Minicomputer?



Complete this numeral chart.

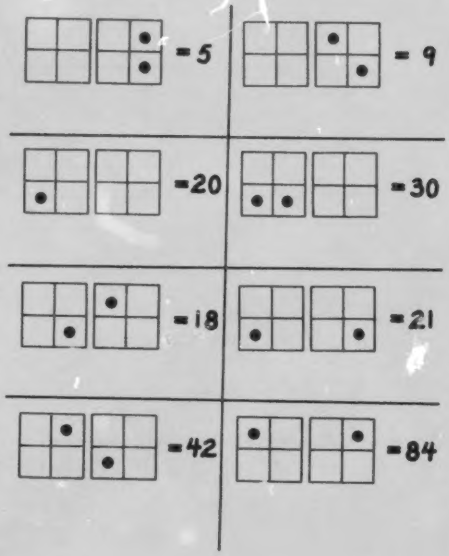
0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108	109

Label the dots.



6

Put the number on the Minicomputer



7

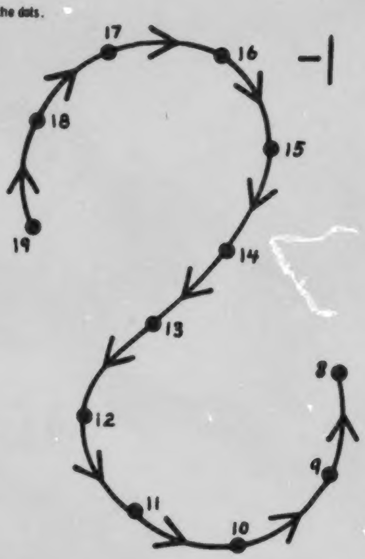
Standard configurations are given here; however, many other solutions are possible.

How much money?

1¢ 1¢ 1¢ 1¢ 1¢	5 ¢
10¢ 1¢	11 ¢
10¢ 10¢ 1¢	21 ¢
10¢ 10¢ 10¢ 10¢	40¢
10¢ 10¢ 10¢ 1¢	31 ¢
10¢ 10¢ 10¢ 1¢ 1¢	32¢

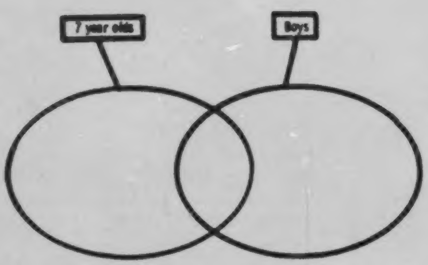
8

Label the dots.



9

Draw a dot for yourself in this picture.



Solution depends on the student.

Finish the number stories.

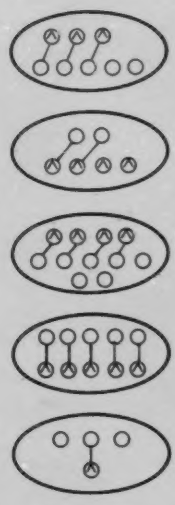
$\hat{3} + 5 = \underline{\ 2\ }$

$2 + \hat{4} = \underline{\ \hat{2}\ }$

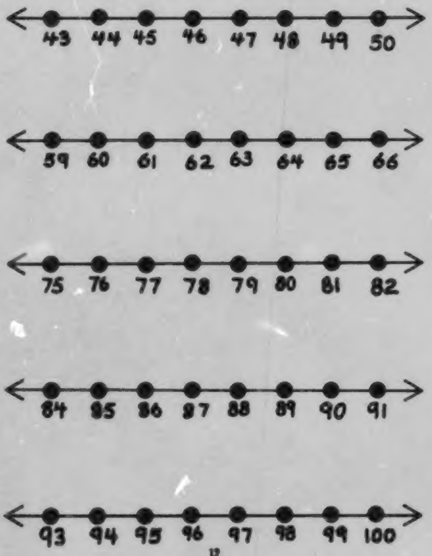
$\hat{4} + 7 = \underline{\ 3\ }$

$5 + \hat{5} = \underline{\ 0\ }$

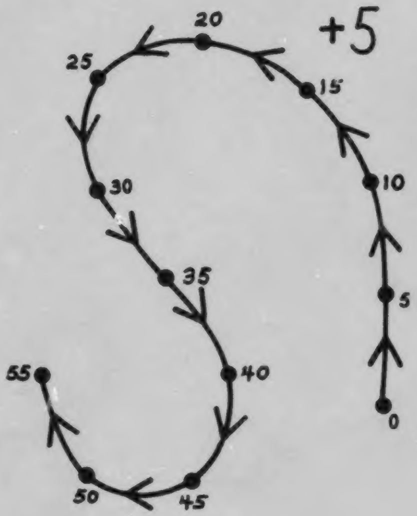
$3 + \hat{1} = \underline{\ 2\ }$



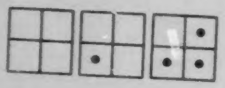
Label the dots on these number lines.



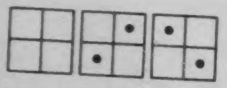
Label the dots.



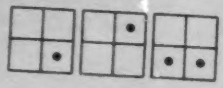
What number is on the Minicomputer?



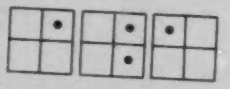
= 27



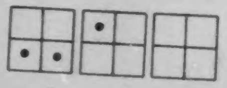
= 69



= 143



= 458

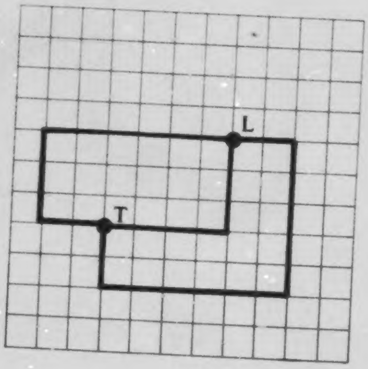


= 380

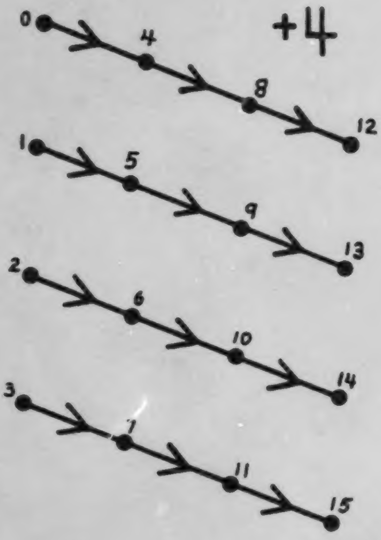
How long is the red path? 7 blocks

How long is the blue path? 11 blocks

How long is the black path? 15 blocks



Label the dots.



Finish the number stories.

$2 + 4 = 6$

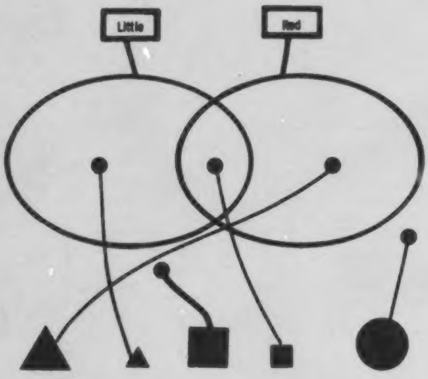
$5 + \hat{4} = 1$

$\hat{3} + \hat{3} = \hat{6}$

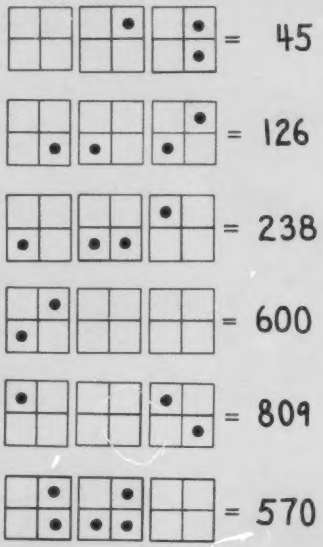
$3 + \hat{4} = \hat{1}$

$\hat{5} + 6 = 1$

Match the dots with the shapes. One is done for you.

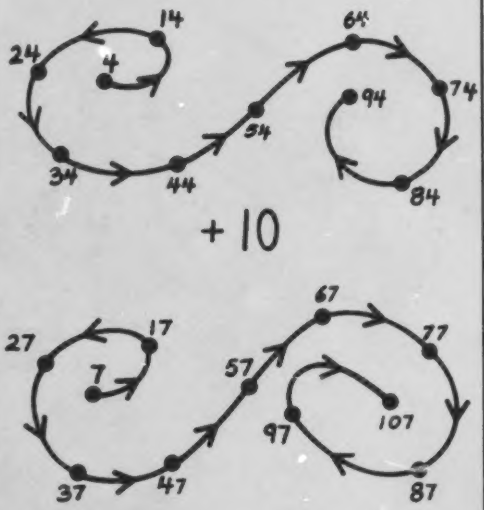


Put the number on the Minicomputer.

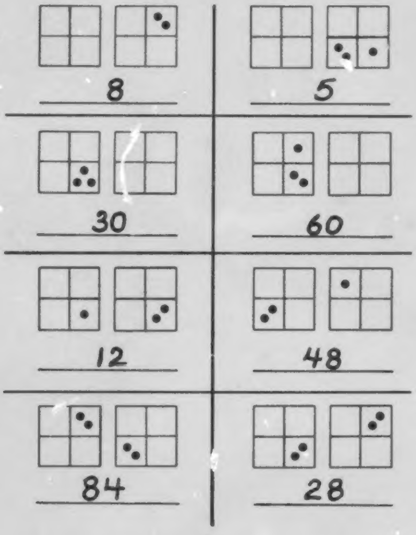


Standard configurations are given here; however, many other solutions are possible.

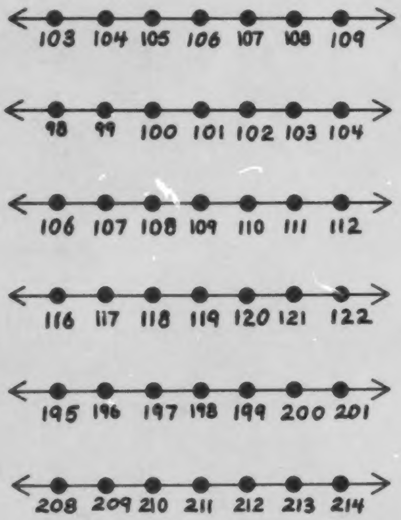
Label the dots.



What number is on the Minicomputer?

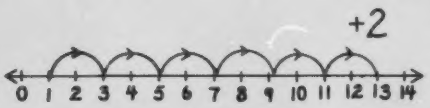


Label the dots on these number lines.

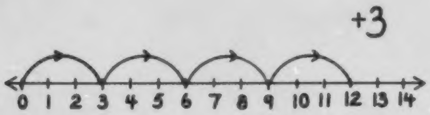


22

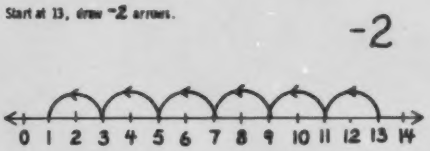
Start at 1, draw +2 arrows.



Start at 0, draw +3 arrows.

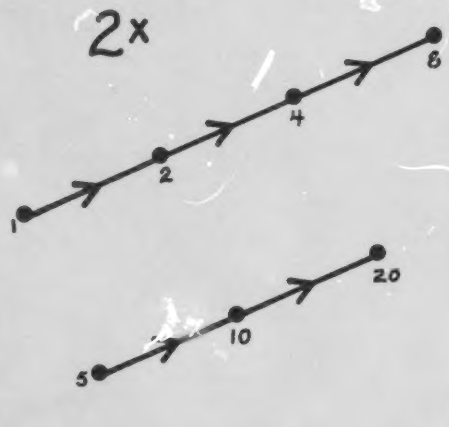


Start at 13, draw -2 arrows.



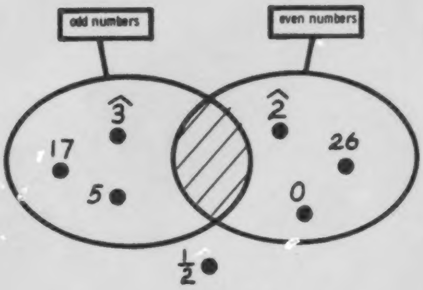
23

Label the dots.



24

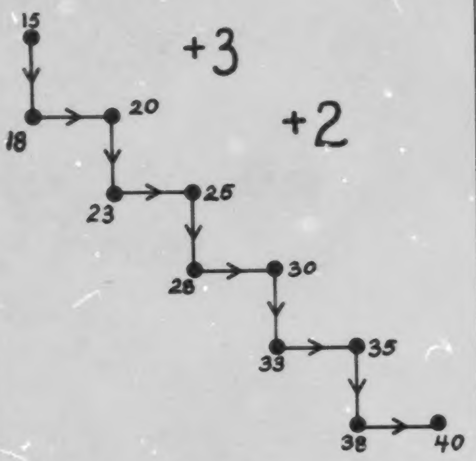
Put at least four numbers in this string picture.



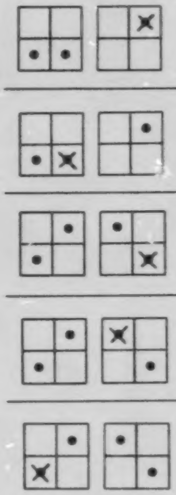
25

Many solutions are possible. The hatching of the middle region indicates that it is empty. Accept, but do not expect, inclusion of negative numbers and fractions.

Label the dots.



Finish the number stories.



34 - 4 = 30

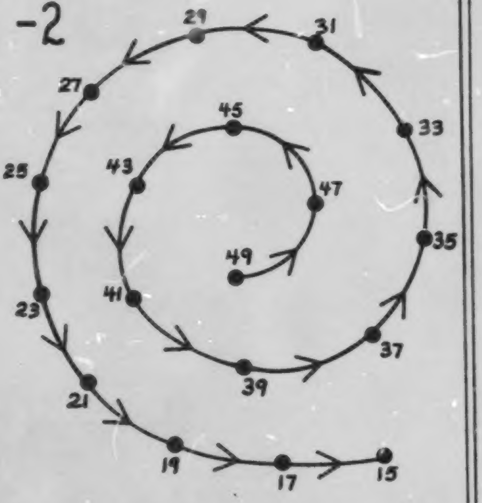
34 - 10 = 24

69 - 1 = 68

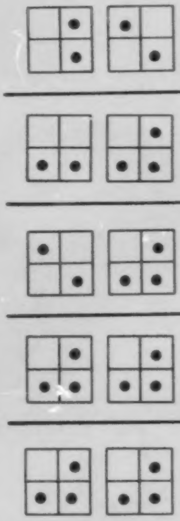
69 - 8 = 61

69 - 20 = 49

Label the dots.



Finish the number stories.



41 + 18 = 59

22 + 15 = 37

80 + 17 = 97

51 + 26 = 77

34 + 43 = 77

Finish the number stories.

$100 + \widehat{100} = $ 0

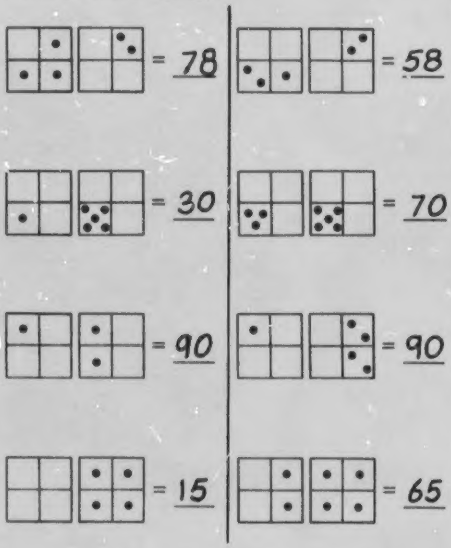
$\hat{1} + 201 = $ 200

$\widehat{50} + 10 = $ $\widehat{40}$

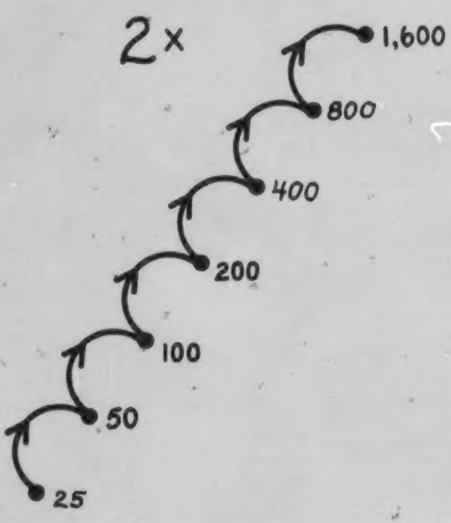
$\widehat{21} + \widehat{21} = $ $\widehat{42}$

$68 + \hat{2} = $ 66

What number is on the Minicomputer?



Label the dots.



S68.1 Doubling and Halving #2

CAPSULE LESSON SUMMARY

Draw return arrows and label dots in several 2 x arrow roads in which the position of a given number varies.

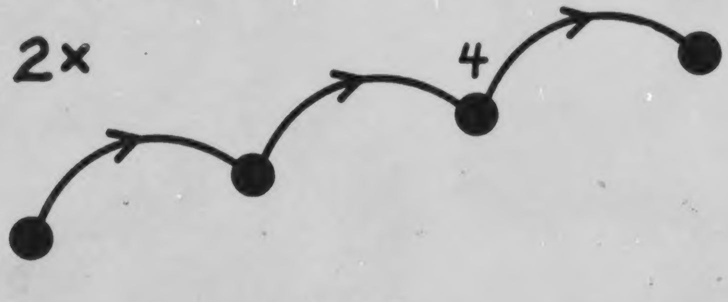
MATERIALS

Teacher: Colored chalk

Student : None

DESCRIPTION OF LESSON

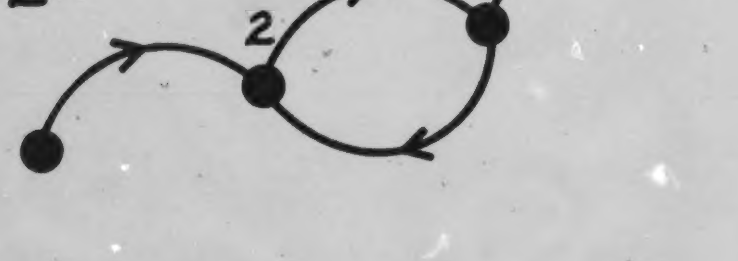
Draw this arrow picture near the top of the chalkboard.



T: What are these red arrows for? (2 x)

Which numbers besides 4 are in this arrow picture? (1,2,8)

Ask students who answer correctly to label the appropriate dots and to explain. For example, the student who says that 2 is in the picture might explain that 2 x 2 = 4. Also emphasize that going from 4 to 2 is against the red arrow and draw a blue arrow from 4 to 2.



T: What could this blue arrow be for?

S: -2.

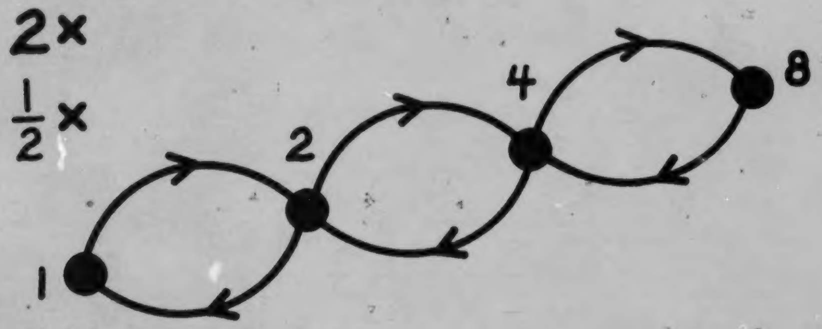
T: Yes, it could be for -2 because $4 - 2 = 2$; but here the blue arrow is not for -2.

S: $\frac{1}{2}\times$ (read: "one-half of").

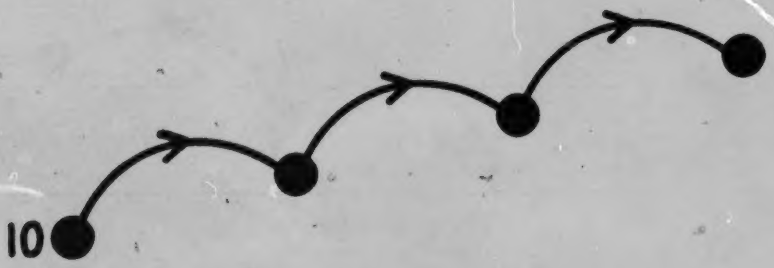
If necessary, suggest this yourself. In any case, write "$\frac{1}{2}\times$" in blue near the arrow picture. Trace the appropriate arrows as you review the picture.

T: Yes; $2 \times 2 = 4$ and $\frac{1}{2} \times 4 = 2$.

When all the dots have been labeled, ask the class to find where other $\frac{1}{2}\times$ arrows can be drawn. Continue until the arrow picture is completed.



Below the first arrow picture, draw a second one (with its dots directly below the dots in the first one).



Allow some time for the students to comment on this arrow picture.

T: How many people do we need to show ten fingers?

S: One.

Have one student stand and hold up ten fingers. Trace the arrow starting at 10.

T: 2 x 10. We want to calculate "2 x 10" so we need another ten fingers.

Have another student stand and hold up ten fingers.

T: Now we have ten fingers, twice (i.e., 2 x 10 fingers). Who would like to count these fingers by ten for us?

S: 10; 20.

T: 10 + 10 = 20; 2 x 10 = 20.

Ask a volunteer to label the dot for 20; then, trace the arrow starting at 20.

T: 2 x 20 = . . . ? We have the 20 fingers that we just counted. We want to calculate "2 x 20" so we need another 20 fingers. How many more students do we need to show 20 more fingers?

S: Two more.

Ask two more volunteers to stand together aside the first two students, and to hold up their fingers.

T: Now we have 2 x 20 fingers.
Who would like to count these fingers by ten for us?

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S: 10; 20; 30; 40.

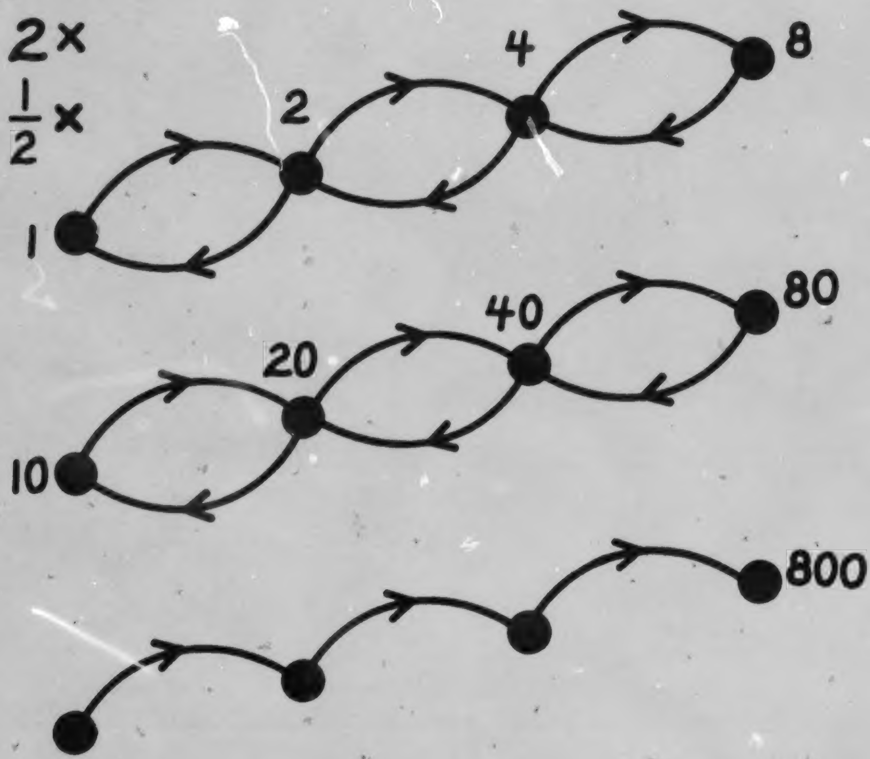
T: 20 + 20 = 40; 2 x 20 = 40.

Ask a volunteer to label the dot for 40. Proceed, in a similar manner, to calculate "2 x 40".

T: Can we draw some more $\frac{1}{2}$ x arrows now?

As each arrow is drawn, ask the volunteer to tell the corresponding number story. Continue until the arrow picture is complete.

Draw a third arrow picture below the first two, aligning the dots as much as possible.



Allow the students to comment on the arrow picture. Compliment any student who notices that 8, 80, and 800 are in similar positions.

Point to the dot which precedes the dot for 800.

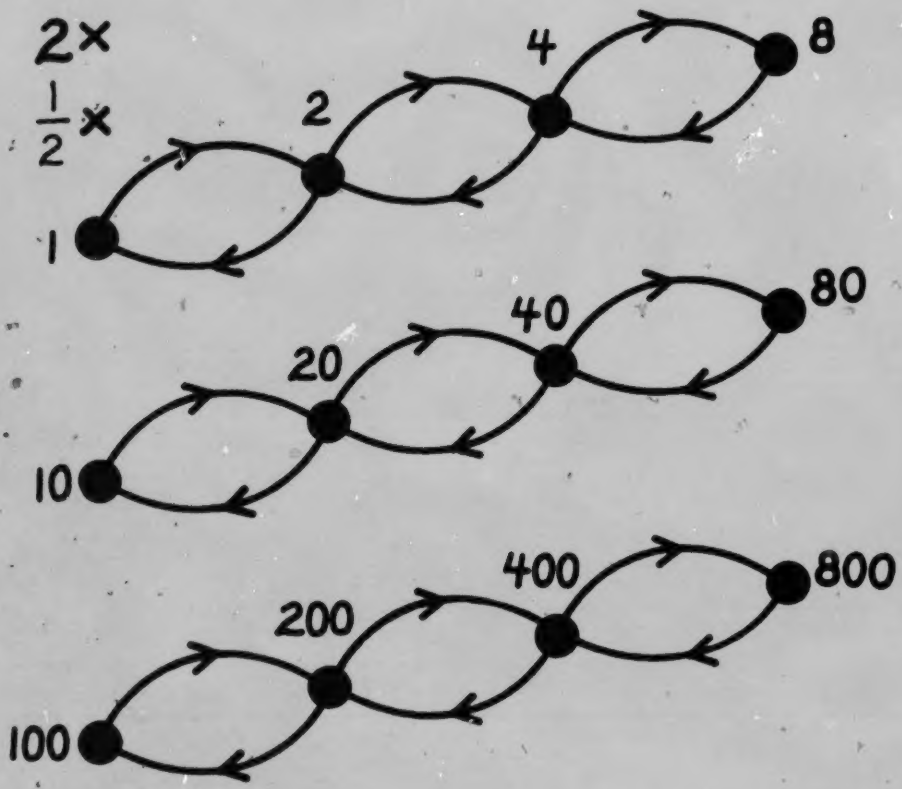
T: We'd like to label this dot. Does any one have a suggestion?

Perhaps a student will suggest drawing a return arrow (for $\frac{1}{2}$ x) from 800 to this dot; but if necessary, suggest this yourself.

Continue until all of the $\frac{1}{2}$ x arrows have been drawn.

T: Now let's follow these blue arrows to label all of the dots. Who can label a dot?

As each dot is labeled, tell the appropriate number stories yourself. When the dot for 400 is labeled, for example, the appropriate number stories are "$\frac{1}{2}$ x 800 = 400" and "2 x 400 = 800". Continue in this manner until the arrow picture is complete.



S 68

T: Do you see any patterns in this arrow picture?

Encourage the class to recognize that the four numbers in the second and third arrow pictures are each ten times greater than the number in the arrow picture above it.

S68.2 Introduction to Frames

CAPSULE LESSON SUMMARY

Fill in a box (frame) with a number to complete a true number story. Notice patterns in the various sequences.

MATERIALS

Teacher: None

Student : Worksheets 68.2* and **

DESCRIPTION OF LESSON

Write this expression on the board.

$$5+\square=6$$

This expression (open sentence) is read: five plus "box" equals six, or five plus "what number" equals six.

T: What number should go in this box to make the number story true?

S: 1.

Write "1" in the box.

$$5+\boxed{1}=6$$

Write a second open sentence on the board.

$$5+\boxed{1}=6$$
$$5+\square=7$$

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When a student suggests that 2 goes in the box, complete the number story. Continue this process, each time writing open sentences, one below the other, until you run out of space at the board.

$$\begin{gathered}
5 + \boxed{1} = 6 \\
5 + \boxed{2} = 7 \\
5 + \boxed{} = 8 \\
5 + \boxed{} = 9 \\
5 + \boxed{} = 10
\end{gathered}$$

T: Do you see any patterns in these number stories?

S: They all start with 5.

S: The numbers in the box go 1, 2, 3, 4, 5, and so on.

S: The numbers on the right go 6, 7, 8, 9, 10, and so on.

Erase the board and write "$10 = 10 + \boxed{}$" on the board.

T: What number should go in the box to make this number story true?

S: 0.

Write "0" in the box. Continue this activity until you complete four or five number stories.

$$\begin{gathered}
10 = 10 + \boxed{0} \\
10 = 9 + \boxed{1} \\
10 = 8 + \boxed{2} \\
10 = 7 + \boxed{3} \\
10 = 6 + \boxed{4}
\end{gathered}$$

T: Do you see any patterns?

If necessary, direct the students' attention to each of the three columns, and how the numbers in each change, or remain unchanged.

Continue this lesson with the following sequences or any similar ones which are appropriate for the abilities of your students.

$2 \times 0 = \square$
$2 \times 1 = \square$
$2 \times 2 = \square$
$2 \times 3 = \square$

$1 + 1 = \square$
$10 + 10 = \square$
$100 + 100 = \square$
$1{,}000 + 1{,}000 = \square$

$\square + 2 = 3$
$\square + 2 = 5$
$\square + 2 = 7$
$\square + 2 = 9$

$10 - 2 = \square$
$10 - 4 = \square$
$10 - 6 = \square$
$10 - 8 = \square$
$10 - 10 = \square$

Worksheets S68.2* and ** are available for individual work.

Name ____________ S 68.2 *

Complete.

$1 + 1 = \boxed{2}$
$2 + 1 = \boxed{3}$
$3 + 1 = \boxed{4}$
$4 + 1 = \boxed{5}$
$5 + 1 = \boxed{6}$

$1 + 1 = \boxed{2}$
$2 + 2 = \boxed{4}$
$3 + 3 = \boxed{6}$
$4 + 4 = \boxed{8}$
$5 + 5 = \boxed{10}$

$10 + 1 = \boxed{11}$
$10 + 2 = \boxed{12}$
$10 + 3 = \boxed{13}$
$10 + 4 = \boxed{14}$
$10 + 5 = \boxed{15}$

$10 - 1 = \boxed{9}$
$10 - 2 = \boxed{8}$
$10 - 3 = \boxed{7}$
$10 - 4 = \boxed{6}$
$10 - 5 = \boxed{5}$

$6 + 6 = \boxed{12}$
$7 + 7 = \boxed{14}$
$8 + 8 = \boxed{16}$
$9 + 9 = \boxed{18}$
$10 + \boxed{10} = 20$

$6 + 5 = \boxed{11}$
$7 + 5 = \boxed{12}$
$8 + 5 = \boxed{13}$
$9 + 5 = \boxed{14}$
$10 + \boxed{5} = 15$

$6 + 1 = \boxed{7}$
$6 + \boxed{2} = 8$
$6 + \boxed{3} = 9$
$6 + \boxed{4} = 10$
$6 + 5 = \boxed{11}$

$8 + \boxed{2} = 10$
$8 + \boxed{4} = 12$
$8 + \boxed{6} = 14$
$8 + 8 = \boxed{16}$
$8 + 10 = \boxed{18}$

Name ____________ S 68.2 **

Complete.

$14 - 4 = \boxed{10}$
$13 - 3 = \boxed{10}$
$12 - \boxed{2} = 10$
$11 - \boxed{1} = 10$
$\boxed{10} - 0 = 10$

$10 + 5 = \boxed{15}$
$20 + 5 = \boxed{25}$
$30 + \boxed{5} = 35$
$40 + \boxed{5} = 45$
$\boxed{50} + 5 = 55$

$7 - 3 = \boxed{4}$
$7 - 4 = \boxed{3}$
$7 - 5 = \boxed{2}$
$7 - \boxed{6} = 1$
$7 - \boxed{7} = 0$

$\boxed{20} = 10 + 10$
$\boxed{40} = 20 + 20$
$60 = 30 + \boxed{30}$
$80 = \boxed{40} + 40$
$100 = 50 + \boxed{50}$

$100 + \boxed{100} = 200$
$101 + 101 = \boxed{202}$
$102 + 102 = \boxed{204}$
$103 + \boxed{103} = 206$
$\boxed{104} + 104 = 208$

$\boxed{100} = 50 + 50$
$\boxed{102} = 51 + 51$
$104 = \boxed{52} + 52$
$106 = \boxed{53} + 53$
$108 = 54 + \boxed{54}$

$\boxed{100} = 100 + 0$
$100 = 98 + \boxed{2}$
$100 = 96 + \boxed{4}$
$100 = 94 + \boxed{6}$
$100 = \boxed{92} + 8$

$5 + \boxed{5} = 10$
$15 + 15 = \boxed{30}$
$25 + \boxed{25} = 50$
$35 + 35 = \boxed{70}$
$45 + 45 = \boxed{90}$

S69.1 The Function +10

CAPSULE LESSON SUMMARY

Read the numbers in some of the columns of the 0-109 Numeral Chart and notice patterns. Use a +10 arrow picture as a visual aid to do repeated addition. Ask where those numbers occur in the chart.

MATERIALS

Teacher: 0-109 Numeral Chart; colored chalk
Student : None

DESCRIPTION OF LESSON

The 0-109 Numeral Chart should be prominently displayed during this lesson. If it is difficult for the students to reach the chart, let them use a pointer.

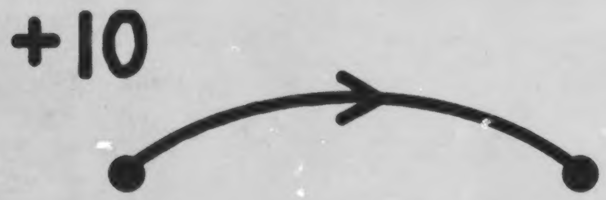
Ask for volunteers to read the following portions of the 0-109 Numeral Chart:

- the first row;
- the last row;
- the first column;
- the last column;
- the third row;
- the fourth column.

When a volunteer finishes reading the fourth column ask the students if they see any patterns in those numbers. The students will probably observe that every number has 3 as the ones' digit, while the tens' digits increase: 1, 2, 3, etc.

S 69

Draw this arrow picture on the board.



T: What is the red arrow for? (+10)
Where is the largest number in this arrow picture? (At the right)
Where is the smallest number in this arrow picture? (At the left)

Point to the dot on the left. As you ask each of the following questions, trace the arrow from left to right and point to the dot on the right. Do not label the dots.

T: If this number were 0, what would this number be? (10)
If this number were 10, what would this number be? (20)
If this number were 20, what would this number be? (30)

Continue in this manner until you reach 110.

T: Where are these numbers in our numeral chart?

S: They are the numbers in the first column.

T: If we read down the first column, how are we counting?

S: By tens.

Repeat this process of adding 10, but begin with 5 rather than 0. Point to the dot on the left, trace the arrow, and point to the dot on the right.

T: If this number were 5, what would this number be? (15)
If this number were 15, what would this number be? (25)
If this number were 25, what would this number be? (35)

Continue in this way until you reach 105.

T: Where are these numbers in our numeral chart?

S: They are the numbers in the sixth column.

T: If we read down this column, how are we counting?

S: By tens.

Point to the dot on the left in the arrow picture. Assign any number from 0 to 90 to this dot and ask the students what number is at the dot on the right. Repeat this activity approximately ten times. Occasionally, ask students who answer correctly to explain how they obtained the answer.

If your class experiences difficulty with this activity, ask a student helper to locate the first number (assigned to the dot on the left) in the 0-109 Numeral Chart. Encourage the idea that when you add 10 to a number on the chart, you obtain the number immediately below it on the chart.

S69.2 Multiplication on the Minicomputer

CAPSULE LESSON SUMMARY

Use the Minicomputer to decide how many glasses three bottles of cider will fill, if each bottle fills 23 glasses. Decide how many doughnuts there are in five boxes, if each box holds one dozen doughnuts.

MATERIALS

Teacher: Minicomputer set
Student : Worksheets S69.2* and **

DESCRIPTION OF LESSON

T: I am having a party so I bought apple cider and doughnuts to serve at the party. I bought three big bottles of cider and each bottle will fill 23 glasses. What calculation will tell us how many glasses I can fill in all?

S: "23 + 23 + 23".

T: Who knows a calculation using " x "?

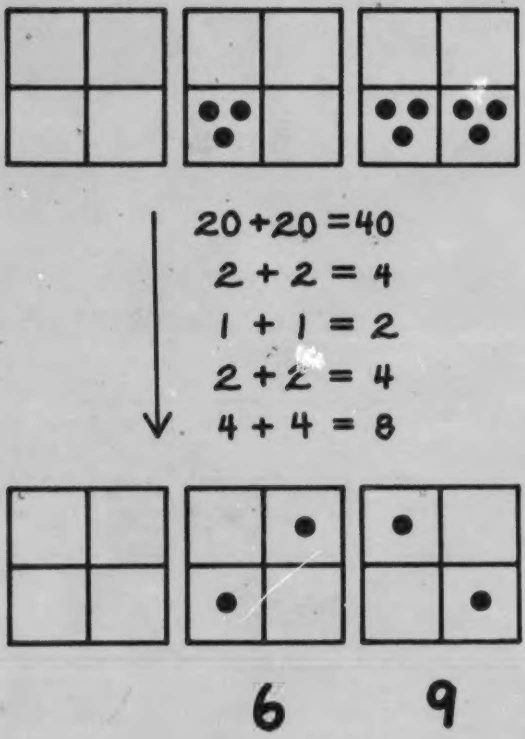
S: "3 x 23".

Write this problem on the board.

$$3 \times 23 =$$

T: What number is 3 x 23?

Accept and record several guesses. Then choose volunteers to put 23 on the Minicomputer three times, to make plays, and to write the answer under the Minicomputer boards.



Complete the number story on the board.

$$3 \times 23 = 69$$

If any students predicted this answer, ask them how they knew. Compliment students who suggest: 3 x 20 = 60 and 3 x 3 = 9, so 60 + 9 = 69.

T: I also bought five boxes of doughnuts. There were 12 doughnuts in each box. What calculation will tell us how many doughnuts I have in all?

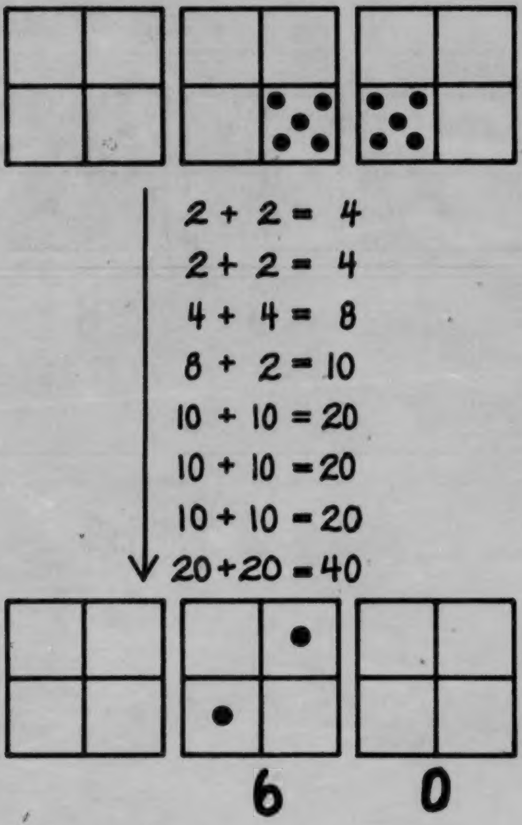
S:1 "12 + 12 + 12 + 12 + 12".

S: "5 x 12".

Write this problem on the board.

$$5 \times 12 =$$

Once again ask for and record guesses. Then, choose volunteers to put 12 on the Minicomputer five times, to make plays, and to write the answer under the boards.



Complete the number story on the board.

$$5 \times 12 = 60$$

If any students predicted this answer, ask for an explanation. Compliment students who suggest: 5 x 10 = 50 and 5 x 2 = 10, so 50 + 10 = 60.

Distribute Worksheet S69.2*. Allow students to use individual Minicomputers if they wish. Students who complete the one-star worksheet should proceed to the two-star worksheet.

Name ____________ S 69.2 *

Complete the number stories.

20 + 5 = 25

11 + 8 = 19

12 + 4 = 16

20 + 14 = 34

44 + 10 = 54

12 + 24 = 36

41 + 18 = 59

22 + 15 = 37

80 + 17 = 97

51 + 26 = 77

34 + 43 = 77

Name ____________ S 69.2 **

Complete the number stories.

24 + 15 = 39

25 + 41 = 66

42 + 33 = 75

56 + 40 = 96

24 + 33 = 57

24 + 35 = 59

28 + 22 = 50

25 + 46 = 71

21 + 49 = 70

46 + 18 = 64

68 + 26 = 94

S70 Adjustment Day #7

NOTE: See page 16, Section One NOTES TO THE TEACHER in CSMP Mathematics for the First Grade, Part I for a full explanation of the purpose of scheduled adjustment days.

On this day you may wish to repeat a previous lesson, either for a small group of students or for the entire class. Often the basic content of a particular lesson can be made to appear completely different by adjusting a story line and/or the numbers in a story. Consider the needs of your class in choosing lessons to repeat.

If your students need more opportunities to compare the values of different coins, S56 Arrow Road for Money would be a good lesson to repeat after some modifications.

Your students may benefit from more practice in using cardboard squares to explore and measure the areas of geometrical figures. If so, conduct an activity similar to S57.2 Area #1.

To reinforce the students' growing understanding of division, you may wish to modify and repeat either of the lessons using $\frac{1}{2}x$ on the Minicomputer (S55.1 or S64.1). You may prefer to develop a division problem similar to the one presented in S58.2 Story Problem #3.

If you omitted the worksheets from any previous lesson, you may wish to distribute them today, after an appropriate warm-up activity.

If your class is experiencing little difficulty with the CSMP curriculum, you may wish to omit this adjustment day and continue immediately with S71.1 1/2 x on the Minicomputer #3.

EARLY WARNING!

Among the next nine classroom lessons are some which require extra preparation time, or which make use of materials not included with the CSMP classroom set. The lessons have been listed here for your convenience in preparing for them. A more detailed description of the materials can be found on the first page of each lesson. (These special materials are listed here only once, even if they are needed more often during the nine-day period.)

S72.2 The String Game with Two Strings #3: (The team board and game board must be prepared before the lesson begins.)

S73.2 Coin Problem #3: small, opaque container; four dimes and two pennies

S76.2 Area #2: (For this lesson you may use either a grid board, if one is available, or one of the newsprint grid posters that are included in the CSMP classroom set of materials.)

S79.1 Mental Arithmetic: (For this lesson you must select a combination of mental arithmetic activities from among those offered in several previous lessons.)

S79.2 The String Game with Two Strings #4: (The team board and game board must be prepared before the lesson begins.)

S71.1 1/2x on the Minicomputer #3

CAPSULE LESSON SUMMARY

Using the Minicomputer, find out how many fish a crew of fishermen received if each man receives one half of the day's catch.

MATERIALS

Teacher: Minicomputer set
Student: None

DESCRIPTION OF LESSON

T: Do you know what the pay used to be for people working on big fishing boats? They would receive some of the fish that were caught and then they could sell the fish. Suppose that one day 80 cod fish are caught and the crew gets half of the fish to share among themselves.

Write this problem on the board.

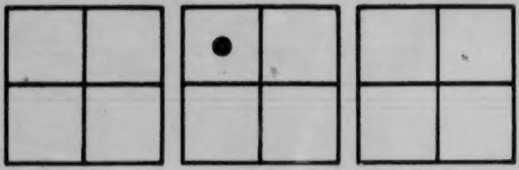
$$\frac{1}{2}\times 80 =$$

T: How many fish does the crew get?

Accept several guesses and record them on the board.

T: Let's calculate "$\frac{1}{2}$ x 80" on the Minicomputer.

Ask a volunteer to put 80 on the Minicomputer.

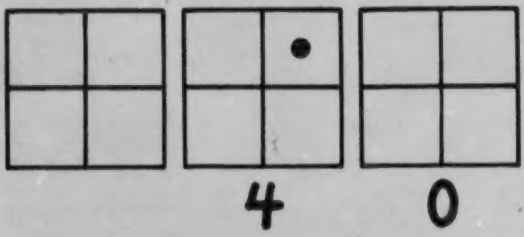


S 71

T: Who can take away one half of 80?

S: We need a backward play first.

Call on students to make the backward play ("80 = 40 + 40"), to take away one half of 80, and to write the answer under the boards.



T: The crew members receive 40 cod fish to share among themselves, because $\frac{1}{2} \times 80 = 40$.

Complete the number story at the board.

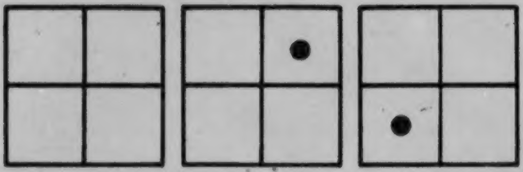
$$\frac{1}{2} \times 80 = 40$$

T: The next day, 42 tuna fish are caught and the crew gets to share one half of the tuna fish.

Write this new problem on the board.

$$\frac{1}{2} \times 42 =$$

Again, let students predict how many fish the crew receives and ask a volunteer to put 42 on the Minicomputer.



T: Who can take away one half of 42?

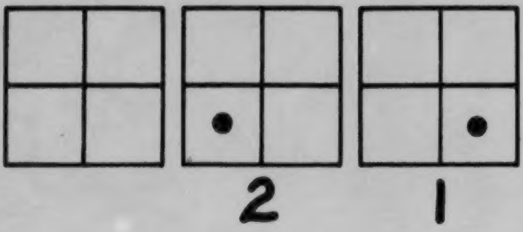
S: We need to make a backward play.

Let a student make one of the two possible backward plays ("2 = 1 + 1" or "40 = 20 + 20").

T: Now who can take away one half of 42?

S: We need another backward play.

Call on volunteers to make the other backward play, to take away one half of 42, and to write the answer under the boards.



T: The crew receives 21 tuna fish to share, because $\frac{1}{2} \times 42 = 21$.

S 71

Complete the number story on the board.

$$\frac{1}{2} \times 42 = 21$$

If the students remain interested, tell a third story and calculate the crew's share of 248 mackerel ($\frac{1}{2} \times 248$); three backward plays ("200 = 100 + 100"; "40 = 20 + 20"; and "8 = 4 + 4") are needed.

S71.2 Story Problem #4

CAPSULE LESSON SUMMARY

Use an arrow picture to help decide how many jump ropes 24 children are using if there are three children for each jump rope.

MATERIALS

Teacher: Colored chalk
Student: Worksheets S71.2* and **

DESCRIPTION OF LESSON

T: On my way to school this morning, I passed a large group of children playing jump rope. How many children could play with one jump rope?

"Three" should be suggested as one possibility.

T: These children had several jump ropes and three children were playing with each rope. There were 24 children in all. How many jump ropes were they using?

Accept several guesses and then ask how the problem might be solved. Allow some time for discussion. There are many ways of solving this problem so the discussion could lead in a number of different directions; but if no one suggests the following method, suggest it yourself.

T: Let's see if we can use arrows to solve the problem.

On the board, draw a dot and label it "0".

T: Let's start with no one playing jump rope.

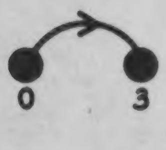
Draw a red arrow from 0 to a second dot.

T: With one jump rope; how many children are playing?

S 71

S: Three.

Label the second dot "3".



T: If we draw an arrow for one more jump rope, how many more children play?

S: Three.

T: So what do you think the red arrow is for?

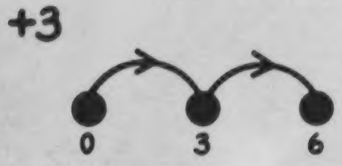
S: +3.

Write "+3" near the picture, in red, and add one more arrow and dot to the picture.

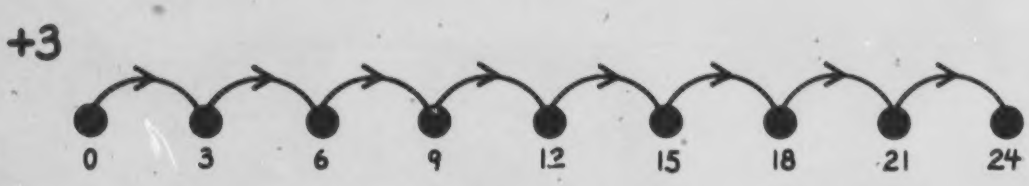
T (tracing the two red arrows): How many children are playing with two ropes?

S: Six.

Label this third dot "6".



Continue in this manner until a dot for 24 is labeled.



T: Now all 24 children are playing jump rope. How many jump ropes are they using?

The students may not agree about the answer, with some saying "nine" and others saying "eight". The disagreement results because some students may count the dots.

T: Do we count the dots or the arrows?

S: Arrows.

T: Why do we count the arrows?

S: Each arrow is for three more children . . . just as each jump rope has three children playing with it.

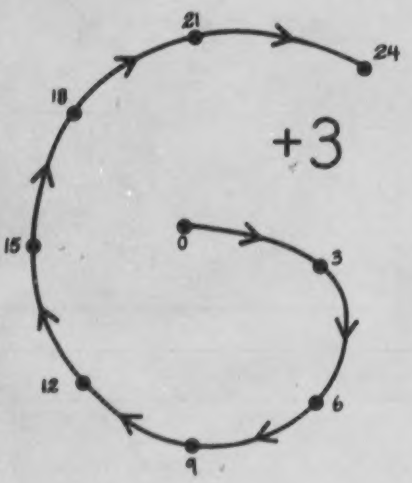
T: Good. So how many jump ropes are there?

S: Eight.

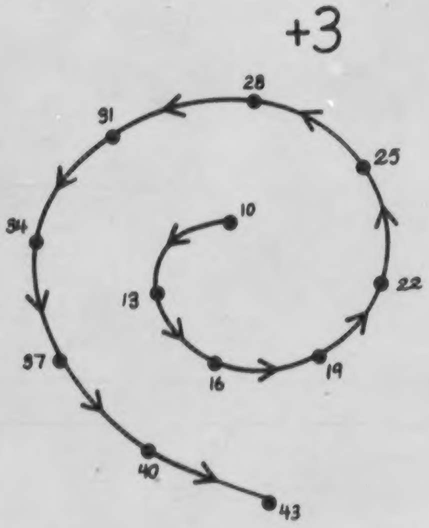
Distribute Worksheet S71.2* and instruct students to label the dots. As students complete S71.2*, give them S71.2**. Ask students who finish both worksheets early to draw all possible +7 arrows in the picture on the reverse of Worksheet S71.2**.

Name ____________ **S 71.2** *

Label the dots.

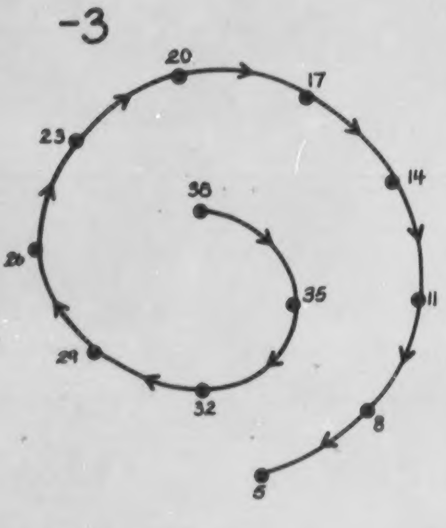


Label the dots.

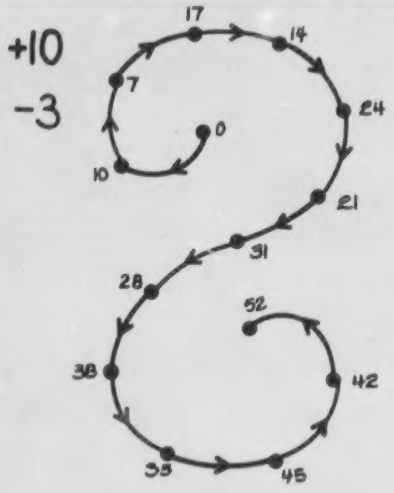


Name ____________ **S 71.2** **

Label the dots.



Label the dots.



S72.1 Eli's Magic Peanuts #5

CAPSULE LESSON SUMMARY

Use a +$\hat{2}$ arrow picture to describe what happens to Eli's peanut supply as he picks pairs of magic peanuts.

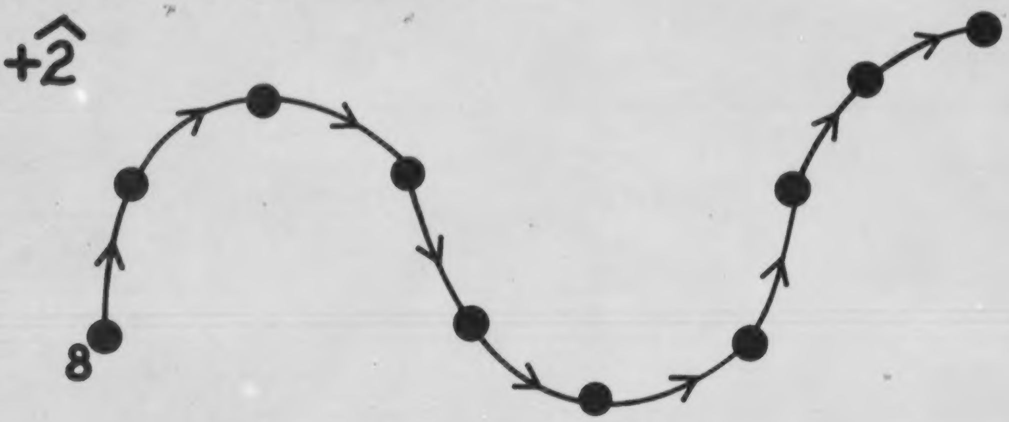
MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

Draw this arrow picture on the board.



T: One day, Eli the elephant goes for a walk. He starts with eight regular peanuts in his bag and goes walking to gather peanuts, but something strange happens. Every bush he comes to has two peanuts on it, and they are both magic peanuts! Each time, Eli puts both magic peanuts in his bag.

Eli starts with eight regular peanuts (point to "8") and adds two magic peanuts (trace the arrow starting at "8"). How many peanuts does he have now?

S: Six regular peanuts.

T: Right. Two magic peanuts make two regular peanuts disappear, so there are six regular peanuts left.

Label the second dot "6" and point to it.

T: Eli has six regular peanuts. At the next bush, he puts two magic peanuts in the bag (trace the second arrow). How many peanuts does he have now?

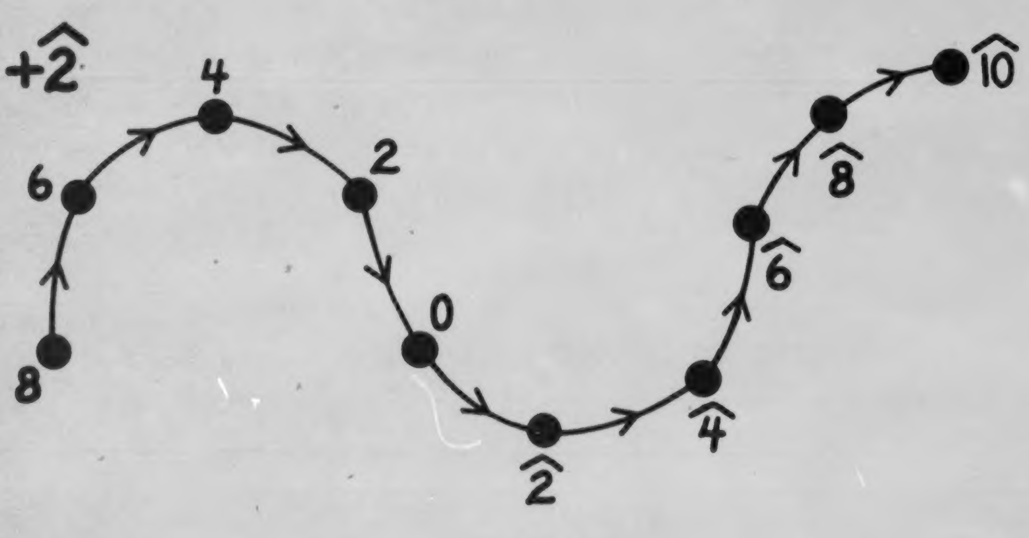
S: Four regular peanuts.

T: Yes; there were six regular peanuts, but the magic peanuts make two of them disappear.

Label the third dot "4".

T: Who can label the next dot?

Choose a volunteer to label the dot ("2") and to explain what happens to leave Eli with this many peanuts. Continue until all the dots are labeled. If students make mistakes, other students should be quick to point them out. For your reference, the completed picture is shown below.



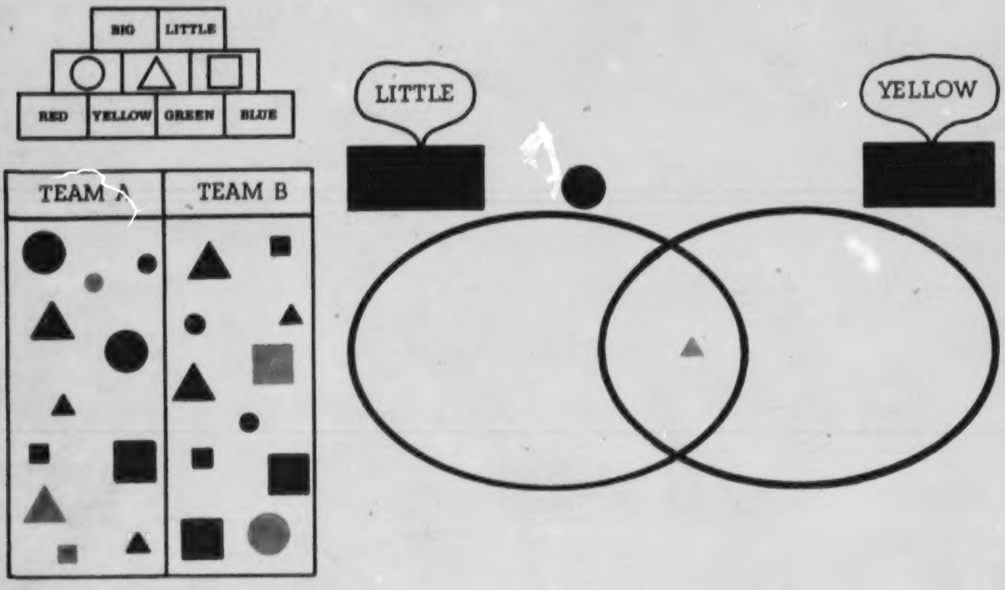
S72.2 The String Game with Two Strings #3

CAPSULE LESSON SUMMARY
Play the String Game with A-Blocks

MATERIALS
Teacher: A-Block String Game kit; colored chalk
Student: None

DESCRIPTION OF LESSON

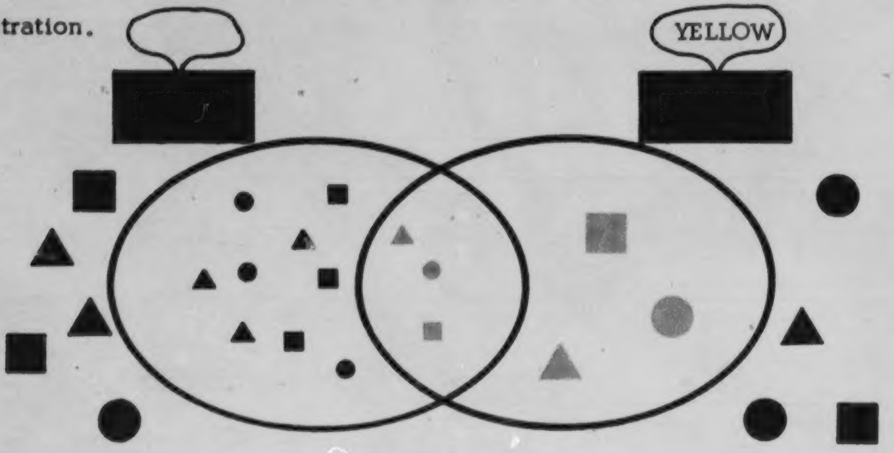
Before beginning the lesson, prepare the team board and pieces, and divide the class into two teams. Draw two strings on the board and place the cards LITTLE and YELLOW face down near the strings. Place two pieces in the picture to serve as starting clues.



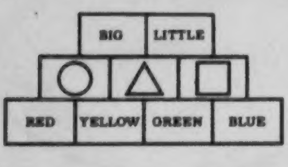
T: Today, we will play the String Game again. These white cards indicate what the strings are for, but for now this is a secret. Look carefully at the two clues I've given you and remember that the strings could be for any of these (point to the list of possible string labels above the team board). Let's read them together.

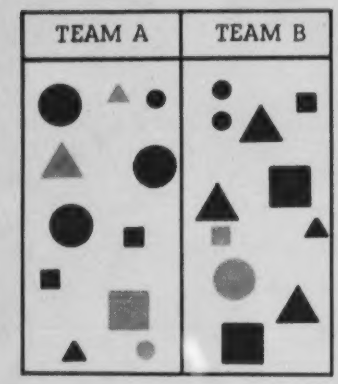
When you have done so, remind the class to remain silent, and then proceed to play the game. If a piece is correctly placed in the string picture, say "yes" and allow the piece to remain; if the piece is incorrectly placed, say "no" and return the piece to the team board. As before, students who correctly place an A-block piece should be given a second turn (but then, play returns to the other team).

To aid you in judging, the correct placement of all pieces is shown in the next illustration.

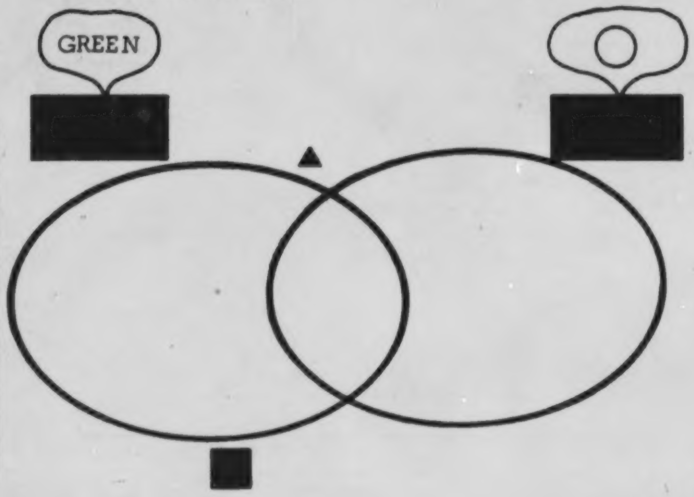


If the students are still interested and some time remains, play the game again with the following starting situation. The second picture shows correct placement of all pieces for this game.

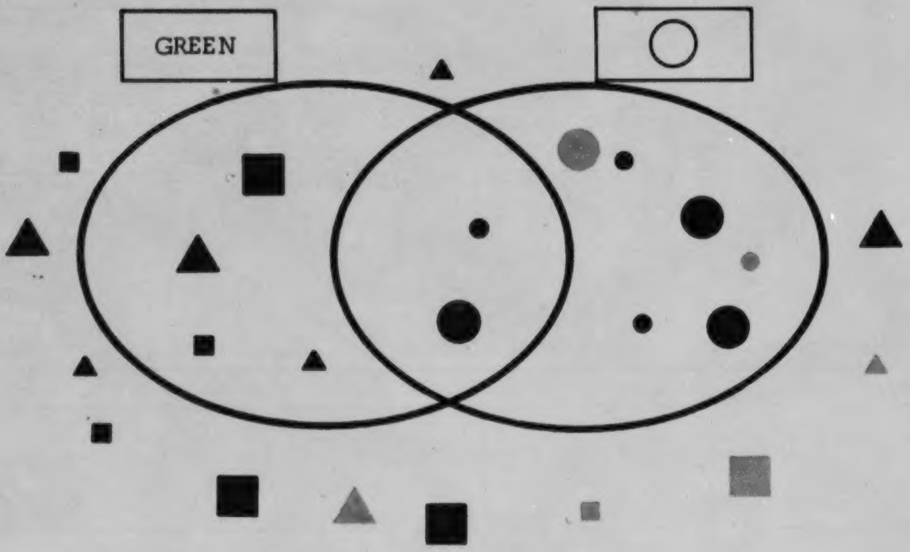




STARTING SITUATION



CORRECT PLACEMENT OF ALL PIECES



S 73

S73.1 Transforming a Number #2

CAPSULE LESSON SUMMARY

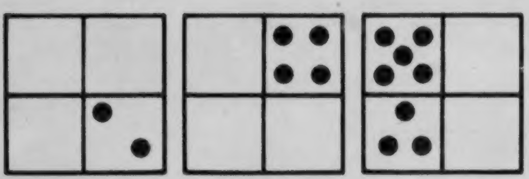
Estimate a number on the Minicomputer in a configuration with many checkers. Move checkers in various ways, each time observing whether this makes the number larger, smaller, or unchanged. Make plays to decide which number is on the Minicomputer and compare it to the estimates.

MATERIALS

Teacher : Minicomputer set
Student : None

DESCRIPTION OF LESSON

Put this configuration of checkers on the Minicomputer.



T : What number have I put on the Minicomputer?

Students might reply that they need to make some plays before they can tell you what this number is. Let this pass for the time being and direct the class to estimate instead.

T : Is this number more than 100? How do you know?

S : Yes; because there are two checkers on the 100-square and that's 200.

T : Is this number more than 200? How do you know?

S : Yes; because there are other checkers beside the two on the 100-square.

T: Is this number more than 300?

Some of your students may be able to recognize and demonstrate that the number is more than 300. If not, conclude simply that the class is uncertain whether or not the number is more than 300.

Write these three words on the board.

LARGER SAME SMALLER

T: Watch very carefully. I am going to do something with these checkers; then, I will point to these words. When I point to the word which describes the number after I've finished, raise your hands.

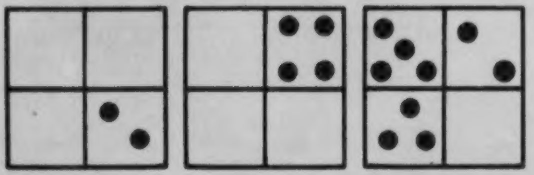
Very deliberately, move a checker from the 2-square to the 4-square. Point to each word in turn. The students should hold up their hands when you point to "LARGER" because the new number is 2 more than the original number. If many students seem unsure, make the move again and give the students another opportunity to respond. Ask students who answer correctly to explain why the new number is larger than the beginning number.

S: The number is 2 larger than before because you moved the checker from the 2-square to the 4-square, and 4 is 2 more than 2.

T: I'll move the checker back to the 2-square so I won't change the number.

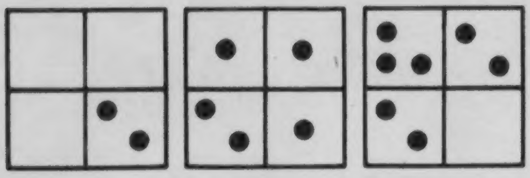
Being as obvious as possible, make an "8 = 4 + 4" play. Point to each word as you did before. If many students do not realize that the number is the same, make the play again and give the students another opportunity to respond. Ask a student who answers correctly to explain why the number is the same as before.

T: The play I made didn't change the number, so I do not need to put the checker back on the 8-square.



Continue this activity with the moves suggested below. Whenever the suggested move changes the number, ask how much larger or smaller the new number is and return the checker (s) to the previous position before you continue.

- Move a checker from the 4-square to the 10-square. (6 larger)
- Add a checker to the 100-square. (100 larger)
- Make a "40 = 20 + 20" play. (Same)
- Move a checker from the 4-square to the 1-square. (3 smaller)
- Make an "8 + 2 = 10" play. (Same)
- Move a checker from the 20-square to the 10-square. (10 smaller)
- Make a "40 + 40 = 80" play. (Same)

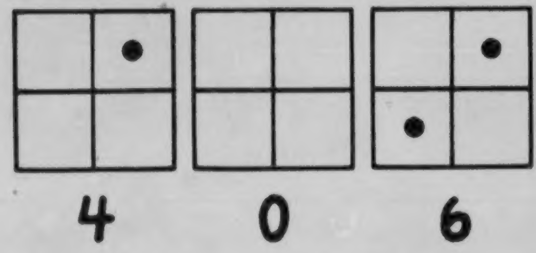


T: Do we still have the same number we started with? (Yes) I've moved some of the checkers, but we've been very careful not to change the number. Is this number more than 300? (Yes) Can you point to the checkers which make 300?

A student should point to two checkers on the 100-square, one checker on the 80-square, and one checker on the 20-square. Ask the class to guess what the number is and record their guesses on the board. Students should object to any guess less than 300, so do not record such a guess.

T: Let's make some plays to find out what this number is. Be sure that the plays you make do not change the number.

Encourage the students to make "8 + 2 = 10" and "80 + 20 = 100" plays whenever possible. When you obtain the standard configuration, ask a student to write the number below the Minicomputer.



Observe that this number is indeed more than 300. Compare the number to the students' guesses and decide which guess is closest.

S73.2 Coin Problem #3

CAPSULE LESSON SUMMARY

With the aid of three clues, discover which coins are in a container.

MATERIALS

Teacher: Four dimes and two pennies; a small opaque container
Student: None

DESCRIPTION OF LESSON

Before the lesson begins, put four dimes and two pennies into a small container, chosen so that the coins inside are not visible, but may be heard clearly when the container is shaken.

T: Today you will be detectives. You must discover how much money is in this container.

Hold up the container and shake it. Allow a few students to shake the container, also.

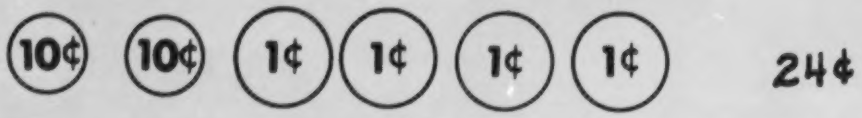
T: All of the coins in this container are either dimes or pennies. What coins could be in this container?

Accept suggestions from the students. When a specific collection of coins is suggested, ask how many cents it would make. When a certain amount of money is suggested, ask how many dimes and pennies would be needed to make that amount. If necessary, remind the students that only dimes and pennies are in the container. (Do not record the students' suggestions on the board.)

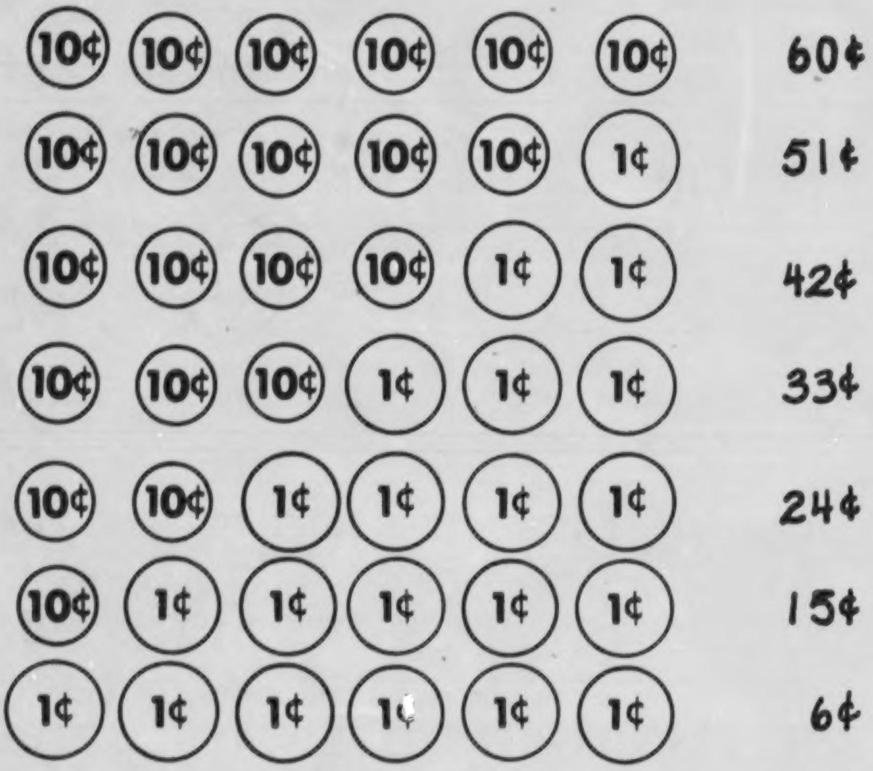
First clue

T: Here is a clue: I have exactly six coins in this container. Each coin is either a dime or a penny. What could be in this container?

Accept several suggestions, recording each possibility on the board. For example, if a student suggests two dimes and four pennies, record the following on the board.



Continue until your list includes all seven possibilities. If necessary, suggest one or more of the possibilities yourself.



T: What is the largest amount of money I could have in this container?

S: 60¢.

T: What is the smallest amount of money I could have in this container?

S: 6¢.

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Second clue

T: There are at least two pennies in this container. Does this clue help us? Can we cross out any of these possibilities?

Cross out the two combinations which may be eliminated (shown below) as students mention them. When the class agrees that no other combinations may be crossed out at this point, erase the two eliminated rows from the board.

~~10¢~~	~~10¢~~	~~10¢~~	~~10¢~~	~~10¢~~	~~10¢~~	~~60¢~~
~~10¢~~	~~10¢~~	~~10¢~~	~~10¢~~	~~10¢~~	~~1¢~~	~~51¢~~
10¢	10¢	10¢	10¢	1¢	1¢	42¢
10¢	10¢	10¢	1¢	1¢	1¢	33¢
10¢	10¢	1¢	1¢	1¢	1¢	24¢
10¢	1¢	1¢	1¢	1¢	1¢	15¢
1¢	1¢	1¢	1¢	1¢	1¢	6¢

T: Now what is the largest amount of money that could be in this container? (42¢)

What is the smallest amount of money that could be in this container? (6¢)

Third clue

T: This is the last clue so listen carefully: there are more dimes than pennies in this container. When you know how much money is in this container, you can whisper it to me.

Accept several whispers (you may need to repeat the last clue). Finally, invite a student to answer aloud (42¢) and reveal the coins to the class.

S 74

S74 "The Weird Story of 24"

CAPSULE LESSON SUMMARY

Read and discuss the storybook "The Weird Story of 24".

MATERIALS

Teacher: "The Weird Story of 24" storybook; Minicomputer set
Student: "The Weird Story of 24" storybook (one copy for each two students)

DESCRIPTION OF LESSON

Although "The Weird Story of 24" partially involves representation of numbers on the Minicomputer, it is a story in the true sense of the word and should be presented that way to the class. Distribute the storybooks before starting the lesson so that your students can follow along with you as you read. Tell the students not to turn the pages of the book until you tell them to (most pages of the storybook which pose a question are followed by a page containing an answer to that question). Then, read the story just as you would read any other story to your class.

Here are some specific suggestions as you progress through the storybook.

page 7:
Ask a student to read the number on the Minicomputer.

page 11:
Put two blue checkers on the 8-square of the Minicomputer, asking a student to place a third blue checker and to explain why it belongs there. Ask students to make plays to check that the number on the Minicomputer is 24.

page 19:
Put one red checker on the 8-square, and one on the 4-square, of the Minicomputer. Give two more red checkers to a volunteer (who should place them similarly). Ask why these additional checkers belong there. Make plays to check

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that the number is 24.

page 25:
Put a checker on the 8-square, and a checker on the 2-square, of the Minicomputer. Give a volunteer three checkers, which should be placed on the 8-square, the 4-square, and the 2-square (respectively). Ask why these new checkers belong there. Make plays to check that the number on the Minicomputer is 24.

pages 28 and 29:
Discuss why 24 is driving this particular train. If necessary, give hints to help point out that there are four cars, with six soldiers each; so there are 24 soldiers on the train.

page 31:
Ask who sent the letter. (24, because 4 x 6 = 24)

When you finish reading the story, allow some time for the class to discuss it. In particular, you may want to discuss what the cat does in the story and how it is affected by 24's antics.

S75 A +10 Spiral

CAPSULE LESSON SUMMARY

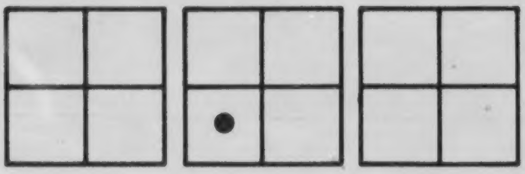
Use the Minicomputer and the 0-109 Numeral Chart to do some +10 mental arithmetic. Label the dots in a +10 spiral.

MATERIALS

Teacher: Minicomputer set; colored chalk; 0-109 Numeral Chart
Student: Worksheets S75* and **

DESCRIPTION OF LESSON

Put a checker on the 20-square of the Minicomputer.

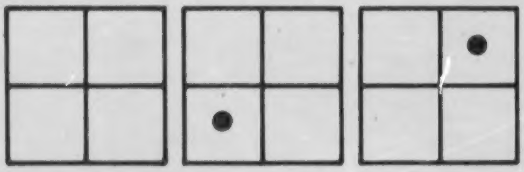


T: What is this number? (20)

Hold a checker over the 10-square of the Minicomputer (without actually putting it on).

T: What number is 20 + 10? (30)

Put this configuration on the Minicomputer.



T: What is this number? (24)

Hold a checker over the 10-square (again, without putting it on).

T: What number is 24 + 10? (34)

Continue by doing the following calculations in a similar manner.

21 + 10
28 + 10
22 + 10

4 + 10
8 + 10
2 + 10

On the 0-109 Numeral Chart, point to any number less than 100. Ask the class what number equals this number plus 10. For example, point to "35" and ask:

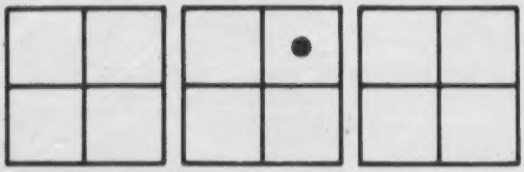
T: What number is 35 + 10?

Repeat this activity several times.

T: Do you see a pattern?

Compliment any student who comments that, on the numeral chart, a number is always located just above the number which is ten larger.

Remove all checkers from the Minicomputer, and put a single checker on the 40-square.



T: What number is this? (40)

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Hold a checker over the 10-square.

T: What number is 40 + 10? (50)

Continue by doing these calculations in a similar manner.

42 + 10
48 + 10
41 + 10

10 + 10
14 + 10
18 + 10

On the 0-109 Numeral Chart, point to any number less than 100. As before, ask the class what number equals this number plus 10. Repeat this activity several times.

Put a checker on the 10-square of the Minicomputer and hold another checker over the 20-square of the Minicomputer (without actually putting it on).

T: What number is 10 + 20? (30)

Continue this activity with the following calculations.

12 + 20
18 + 20
14 + 20

40 + 20
44 + 20
41 + 20

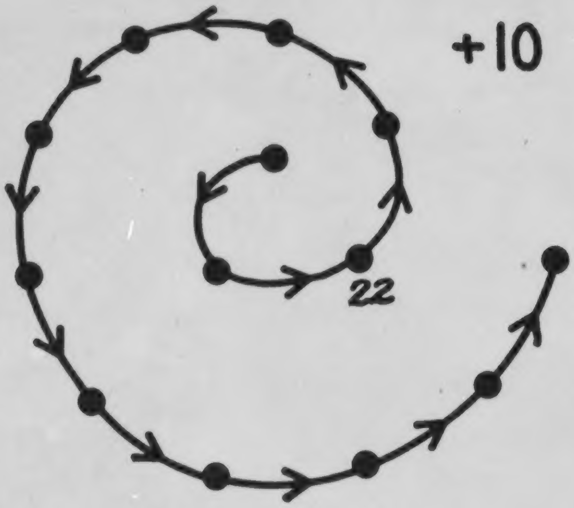
On the 0-109 Numeral Chart, point to any number less than 90. Ask the class what number equals this number plus 20. For example, point to "56" and ask:

T: What number is 56 + 20? (76) How do you know?

S: I added 10 twice; 56 + 10 = 66 and 66 + 10 = 76.

Repeat this activity several times. Compliment any students who recognize that, on the numeral chart, the number which is 20 larger is located two rows below the given number.

Draw this + 10 spiral on the board.



Ask volunteers to label the dots. The students may have difficulty labeling the last two dots (for 112 and 122). If so, count by ones with the students from 102 to 112 and from 112 to 122). Continue until the arrow picture is complete. Then, count with the students by tens, starting at 2, and referring to the spiral.

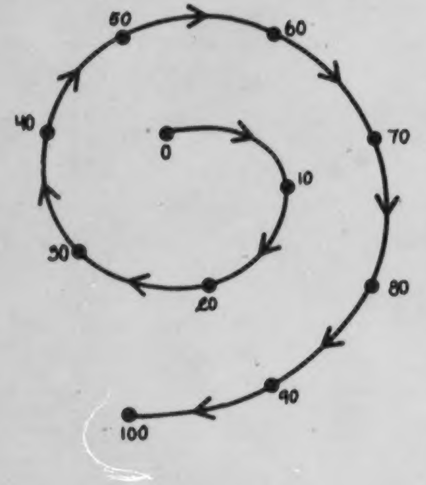
Worksheets S75* and ** are available for individual work.

Name________________

S 75 *

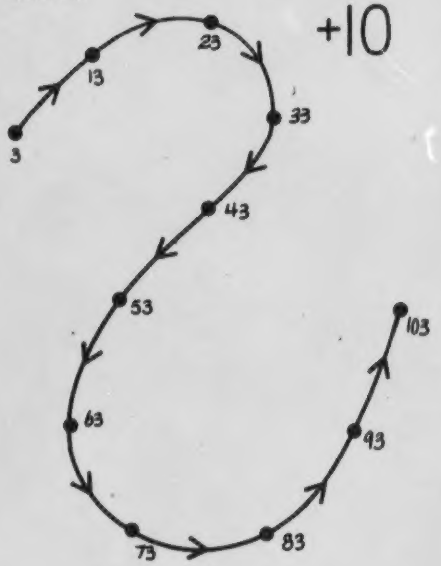
Label the dots.

+10



Label the dots.

+10

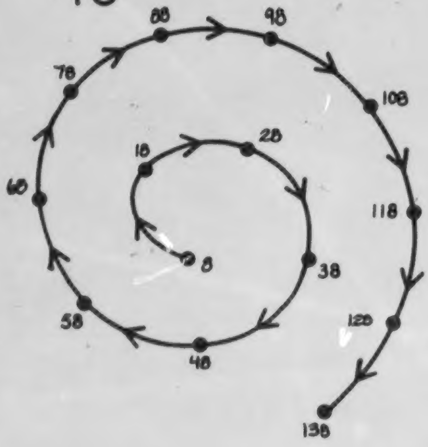


Name________________

S 75 **

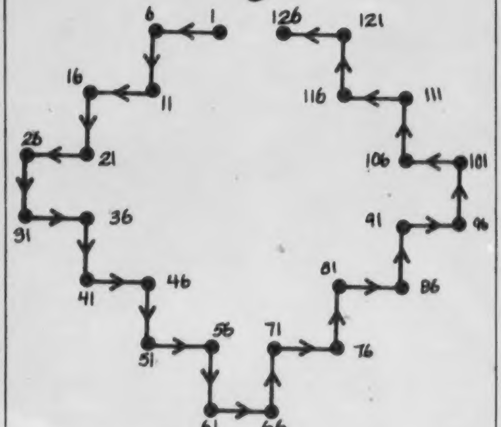
Label the dots.

+10



Label the dots.

+5



S76.1 Detective Story #2

CAPSULE LESSON SUMMARY

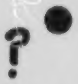
A secret number is the starting dot of an arrow road which ends at 65. Use return arrows to find the secret number.

MATERIALS

Teacher: Colored chalk
Student: None

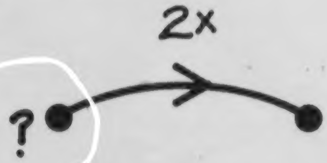
DESCRIPTION OF LESSON

Draw a dot on the board and label it "?".



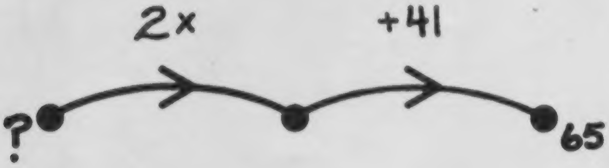
T: This dot is for a secret number.

Draw a red arrow from this dot to a second one.



T: If we multiply the secret number by 2, we'll get another number. I can't tell you that number either, but I can give you this hint about it.

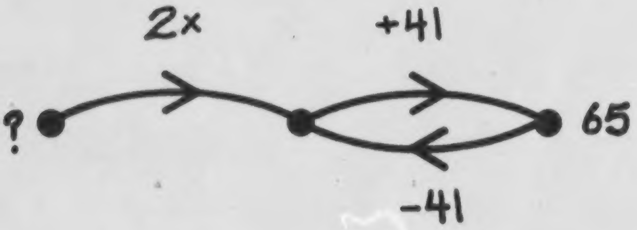
Continue your drawing at the board.



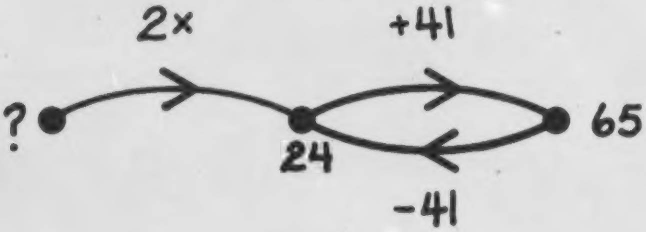
S 76

T: If we add 41 to this number (point to the middle dot), we get 65. How can we figure out what the secret number is?

Allow some time for a discussion of the problem. If a student suggests subtracting 41 from 65, draw a return arrow (in a third color) from 65 to the middle number and label this arrow "- 41". If necessary, simply draw the arrow yourself and ask the class what it could be for.



Ask one student to put 65 on the Minicomputer and another to take away 41. When the answer (24) is obtained, ask a volunteer to label the middle dot.



T: We still don't know the secret number. How can we find it?

Once again, allow time for discussion. If a student suggests taking one half of 24, draw a return arrow from 24 to the secret number and label it "$\frac{1}{2}$ x". Otherwise, simply draw the arrow and ask what it could be for. You may need

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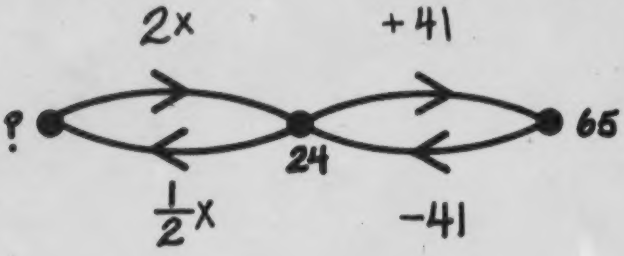
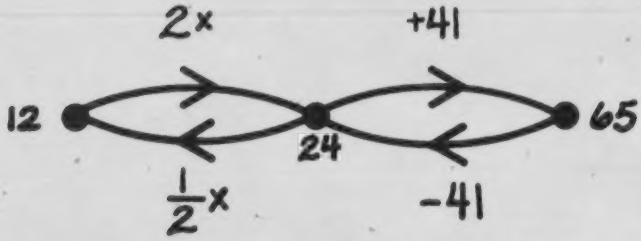
to prompt the class to recall that the return of a 2x arrow is a $\frac{1}{2}$x arrow.



Observe that 24 is on the Minicomputer and ask for a volunteer to take away one half of 24 (two backward plays are needed: "20 = 10 + 10" and "4 = 2 + 2").

When the answer (12) is obtained, ask a student to label the dot for the secret number.



S76.2 Area #2

CAPSULE LESSON SUMMARY

Look at shapes drawn on a grid board and ask how many grid squares each covers. Some shapes cover only half of certain grid squares.

MATERIALS

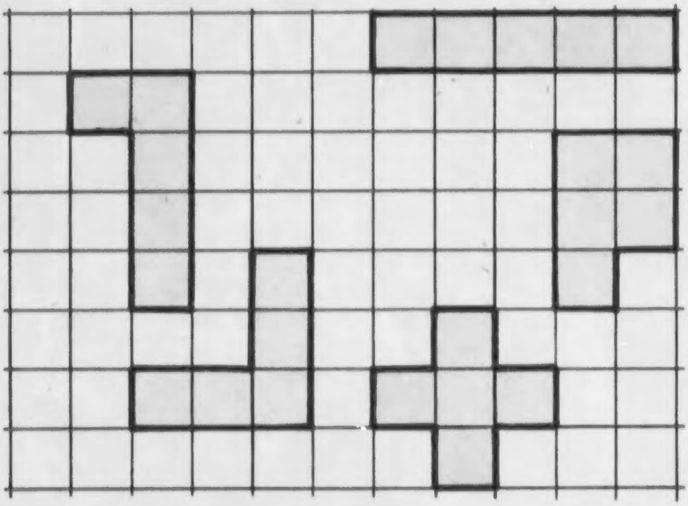
Teacher: Grid board or "Robot Walk" grid sheet
Student: Worksheets 76.2*, **, ***, and ****; colored pencils

DESCRIPTION OF LESSON

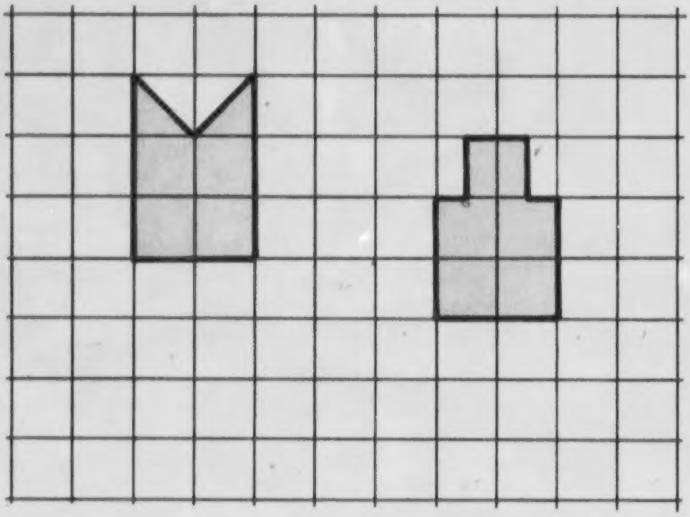
Distribute copies of Worksheet S76.2*

T: On the front of your papers, color a shape that covers exactly five squares. On the back, color a different shape that covers exactly five squares.

Allow enough time for the students to do this and then collect the sheets. Choose several examples and draw them on the grid board or grid sheet. Some possibilities are illustrated below; ask the students if they agree that each shape covers exactly five squares.



It is likely that no one will have colored a shape making use of "half-squares"; if not, draw two such shapes on the grid board.



T: How many squares to each of these shapes cover?

The students may answer "six." If so, point to one of the shapes, count its four complete squares aloud, and then point to the two half-squares.

T: Four squares, plus these. Are these whole squares?

S: No, they're half-squares.

T: If we put two half-squares together, what would we get?

S: One whole square.

T: So how many squares do these shapes cover?

S: Five.

This discussion may be too difficult for some of your students, but it will be needed by those students who may reach the more difficult worksheets of this lesson. In other words, you need not insist that everyone grasp this concept.

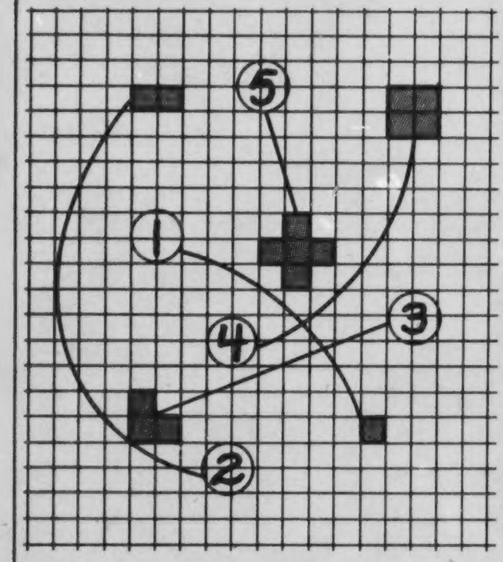
Distribute copies of Worksheet S76.2**.

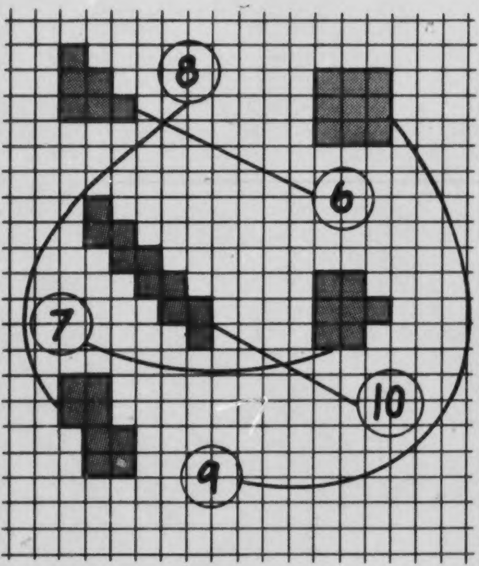
T: On this page there are shapes and numbers. This shape is connected to 1 (trace the curve) because it covers one square. You must connect the other shapes to the numbers that tell how many squares the shapes cover.

As students complete the two-star worksheet, provide the three-star, and then the four-star worksheets.

Name ______________________ S 76.2 **

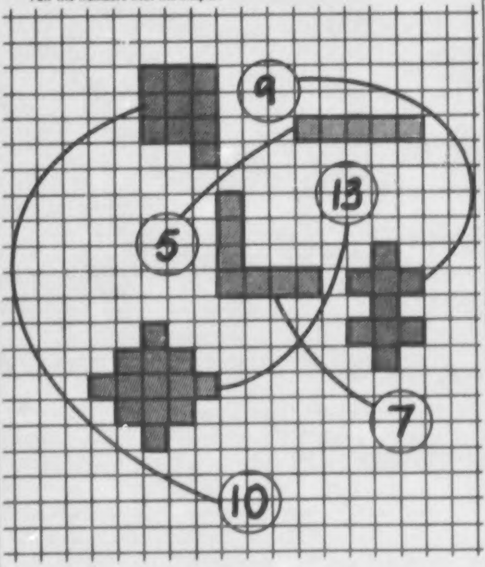
Pair the numbers with the shapes.

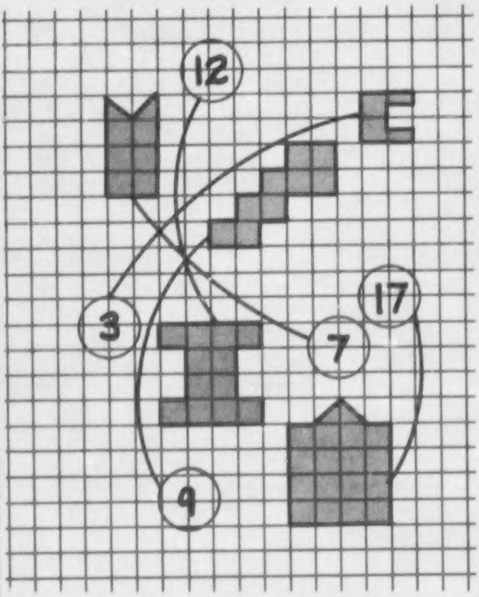




Name ____________________ S 76.2 ***

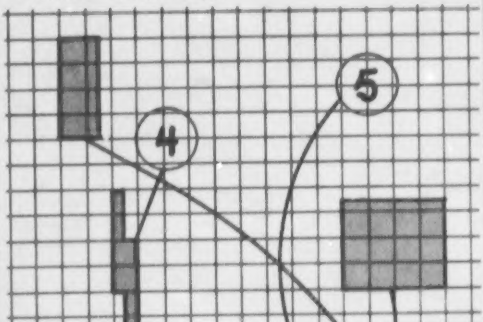
Pair the numbers with the shapes.

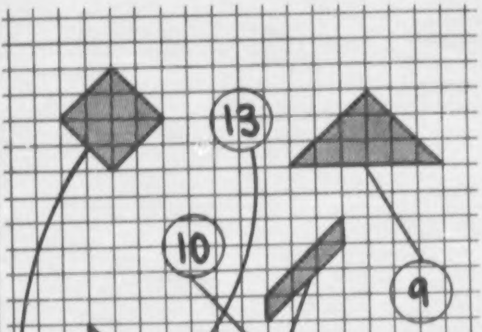




Name ____________________ S 76.2 ****

Pair the numbers with the shapes.





S77.1 Combinatorics with Three Digits #2

CAPSULE LESSON SUMMARY

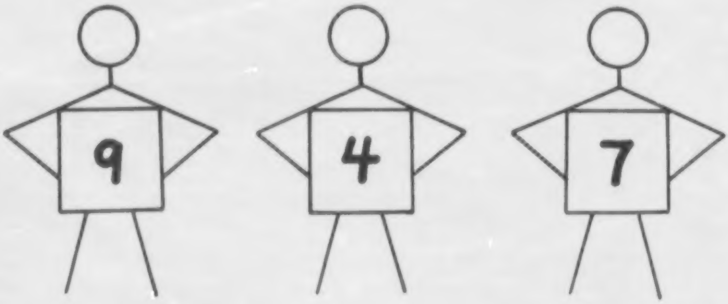
Using numeral cards as a visual aid, discover the six possible three digit numbers which have 9, 4, and 7 as digits. Ask which of these numbers is the largest and which is the smallest. (Optional: Conduct a similar activity with four-digit numbers.)

MATERIALS

Teacher: Demonstration Numeral Card set; Minicomputer set
Student: None

DESCRIPTION OF LESSON

Hold up the "4", "7", and "9" cards from the demonstration Numeral Card set. Ask three students to come to the front of the class and give each of them a numeral card. The order in which the students stand initially is not important. Here is one possible arrangement of the cards.



T: We have shown a number with these numeral cards. What number is it?

S: 947.

Write "947" on the board.

T: What other numbers can we get with these numeral cards?

Accept a suggestion and ask the students holding the numeral cards to show this number by moving to new positions. Resist the urge to tell them where to stand;

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if the three students are unable to decide where they should stand, ask a fourth student to position them.

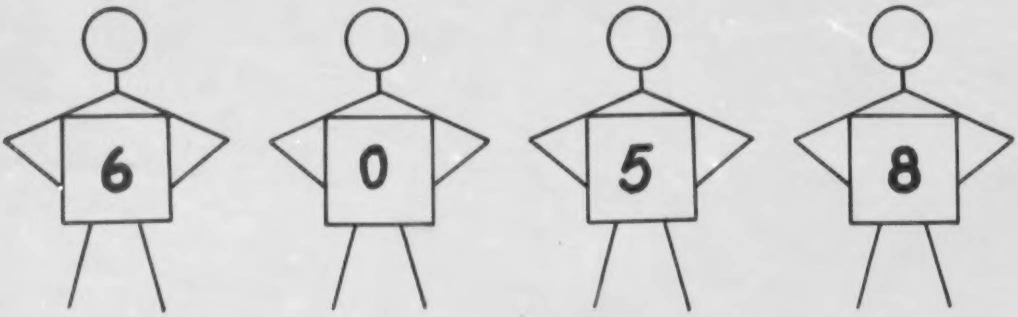
Continue this activity until all six possible numbers are recorded on the board. If necessary, suggest any missing numbers yourself.

947 974
497 794
479 749

Ask the three students to return to their seats.

T: Which of these number is the largest? (974)
Which number is next to the largest? (947)
Which number is the smallest? (479)
Which number is next to the smallest? (497)

If this activity was quite easy for your class, hold up the "0", "5", "6", and "8" numeral cards. Ask four students to hold these cards. The order in which they stand initially is not important. Here is one possible arrangement of the cards.



T: What number do you see?

S: 6,058.

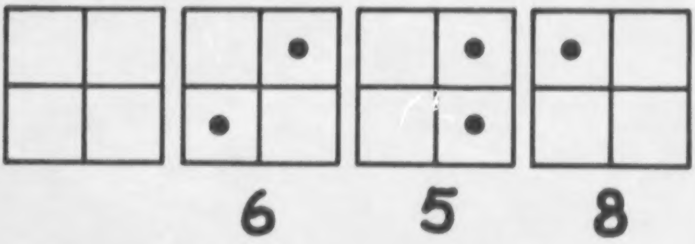
Write "6,058" on the board.

T: What other numbers can we show with these numeral cards?

This activity will be a difficult one for many students. If no one can suggest other possible numbers, ask the students holding the cards to change their positions. Determine what the new number is and encourage the class to suggest a third possibility. However, do not belabor the problem. After a few numbers have been recorded, proceed to Lesson S77.2.

If, on the other hand, your students can suggest some other possibilities, you may wish to continue this activity until five or six new numbers are found and recorded on the board.

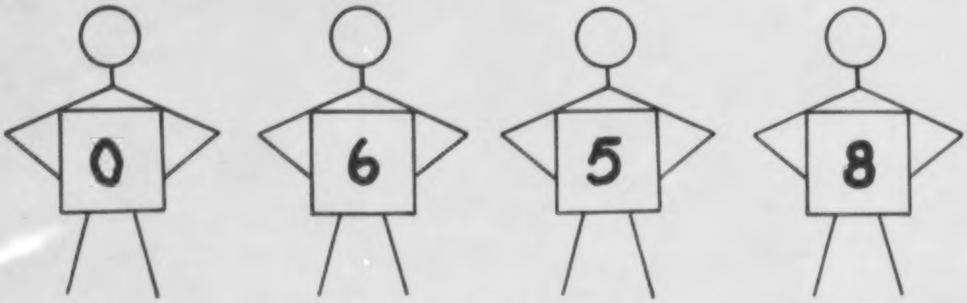
Perhaps someone will suggest a three-digit number, such as 658. The students holding the numeral cards will probably disagree about where to place the "0" card. Display four Minicomputer boards and ask a volunteer to put 658 on the Minicomputer. Ask another volunteer to write the number below the Minicomputer.



T (pointing to the thousands' board): What number could be written below this board?

S: 0.

T: Yes; if we want to show this number using all four numeral cards, we should put the "0" card on the left.



If no students suggest such a number, do not do so yourself.

S77.2 "A Parade of Problems #3"

CAPSULE LESSON SUMMARY

Continue working in the workbook "A Parade of Problems #3". This is the second of two lessons using this workbook.

MATERIALS

Teacher: None
Student : "A Parade of Problems #3" workbook ; colored pencils

DESCRIPTION OF LESSON

NOTE: This is the second lesson using the workbook "A Parade of Problems #3"; the first lesson was Lesson S67.2.

Distribute the students' copies of "A Parade of Problems #3". Instruct students to begin by correcting or completing those pages you have indicated on the workbook cover. Demonstrate this by discussing your method of checking and by turning to a page which requires further work.

When students have finished correcting or completing these pages, they should continue working in the workbook for the remainder of the period.

Collect and check the workbooks[#]. This is the last time this workbook is scheduled for use but at a later time, you may want to allow students to work on pages which require corrections. If so, be aware that not all students should be required to complete the workbook. As mentioned earlier, the difficulty of the problems increases and students who are pushed beyond their abilities may become frustrated. In an average class, about two-thirds of the students should complete through page 10, about one-third should complete through page 20, and only a few may finish the entire workbook.

[#] Answers for the workbook pages follow Lesson S67.2 (pp. 379-386).

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S78.1 The Function +5

CAPSULE LESSON SUMMARY

Label the dots and notice number patterns in a +5 arrow road which starts at 11. Ask for some numbers on which you would land if the road were extended; ask also for some numbers on which you would not land.

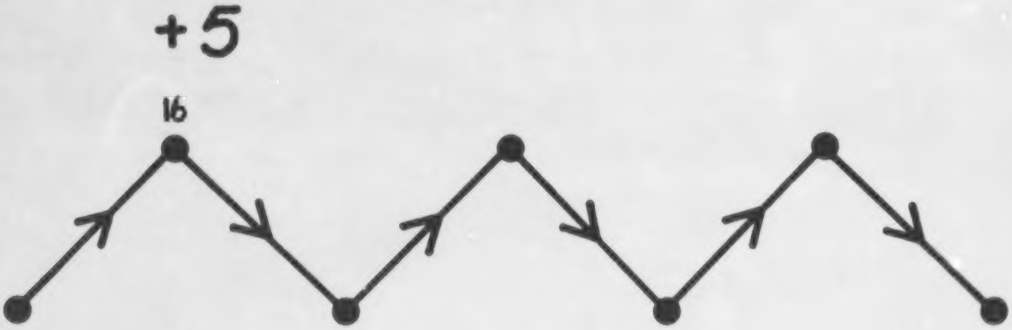
MATERIALS

Teacher: Colored chalk

Student: None

DESCRIPTION OF LESSON

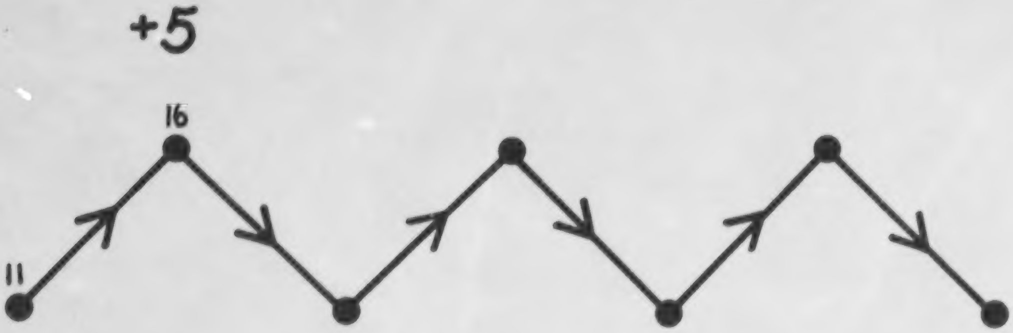
Draw this arrow picture on the board.



T:	What are the red arrows for? (+5)
	Where is the largest number in this arrow picture? (At the far right)
	Where is the smallest number in this arrow picture? (At the far left)
	Which is the smallest number in this arrow picture?

Allow several students to whisper the answer (11) to you before allowing one of them to give the answer aloud.

Call on a volunteer to label the dot for the smallest number.



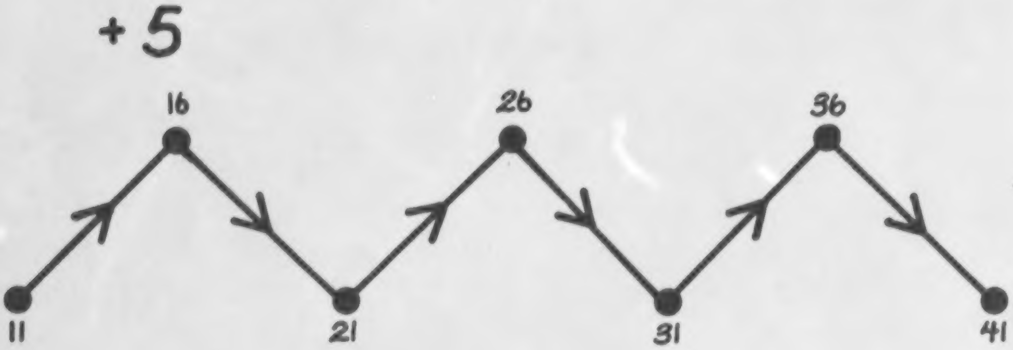
T: How do you know that this number is 11?

S: I counted backward.

S: Because 11 + 5 = 16.

S: Because 16 - 5 = 11.

Send volunteers to label the remaining dots.



T: Do you see a pattern?

S 78

Compliment any students who recognize that all of the upper numbers have 6 as the ones' digit, or that all of the lower numbers have 1 as the ones' digit. If necessary, point this out yourself.

T: What are some other numbers we will land on if we continue to draw +5 arrows?

Accept any whole number whose ones' digit is 6 or 1. You may wish to encourage the students to name some large numbers which would be on this arrow road if it were extended.

T: What are some numbers we will not land on if we extend this +5 arrow road?

Accept any whole number whose ones' digit is neither 6 nor 1.

NOTE: This arrow picture may also be extended to the left to include the negative numbers, although this is a much more difficult activity. Negative numbers on this road would include $\hat{4}$, $\hat{9}$, $\widehat{14}$, $\widehat{19}$, etc.

S78.2 Individual Minicomputers #2

CAPSULE LESSON SUMMARY

On individual Minicomputers do addition calculations which involve one or more forward plays.

MATERIALS

Teacher: Minicomputer set
Student: Minicomputer set; Worksheets S78.2* and **

DESCRIPTION OF LESSON

Each student will need two Minicomputer boards (one Minicomputer sheet) and several checkers. Try to keep the pace of this activity brisk, providing help where needed. Allow the students some time to do each of the following calculations on their Minicomputers; then send a volunteer to perform the calculations on the demonstration Minicomputer.

Write the following problem vertically on the board.

$$\begin{array}{r} 22 \\ +\ 14 \\ \hline \end{array}$$

T: What number is 22 + 14? (36)

Allow the students to predict the answer. Then have them add 22 and 14 on their Minicomputers. Ask a volunteer to add 22 and 14 on the demonstration Minicomputer and to complete the number story.

Continue this activity in a similar way with the following calculations or similar ones which are appropriate for the abilities of your students.

S 78

36
+21

57
+ 20

28
+41

69
+ 2

71
+ 8

25
+40

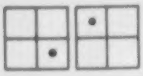
65
+12

Worksheets S78.2* and ** are available for individual work. Explain to the students that the first number has been put on the Minicomputer to help them solve the addition problems. Encourage students who have difficulty to draw the checkers for the second number on the Minicomputer.

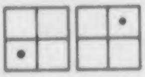
Name

S 78.2 *

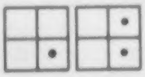
Complete the number stories.



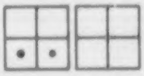
10 + 8 = 18



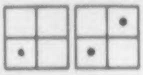
20 + 4 = 24



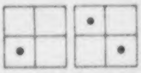
10 + 5 = 15



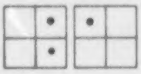
20 + 10 = 30



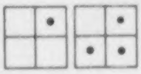
6 + 20 = 26



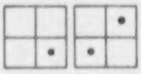
21 + 8 = 29



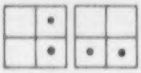
48 + 10 = 58



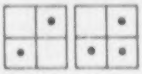
43 + 4 = 47



4 + 12 = 16



11 + 42 = 53

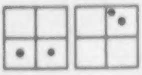


46 + 21 = 67

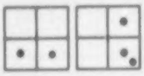
Name

S 78.2 **

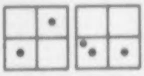
Complete the number stories.



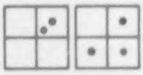
24 + 14 = 38



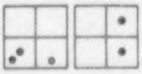
25 + 11 = 36



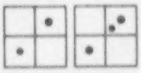
23 + 42 = 65



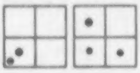
46 + 41 = 87



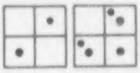
25 + 30 = 55



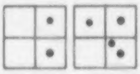
46 + 24 = 70



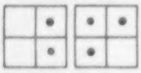
28 + 23 = 51



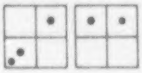
27 + 46 = 73



15 + 49 = 64



46 + 18 = 64



68 + 24 = 92

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S79.1 Mental Arithmetic

CAPSULE LESSON SUMMARY

Choose mental arithmetic activities which would especially benefit your students.

MATERIALS

Teacher: None
Student : None

DESCRIPTION OF LESSON

Spend about ten minutes conducting any combination of mental arithmetic activities described in this volume. Refer to Lessons S2.1 "Who Are You?" Number Game; S16.1 Guess My Rule with Numbers; S45.2 Addition Problems #4; S54.1 Mental Arithmetic with #1 Arrow Pictures; S56 Arrow Road for Money; and S63.1 Addition Activity for examples of mental arithmetic activities.

S79.2 The String Game with Two Strings #4

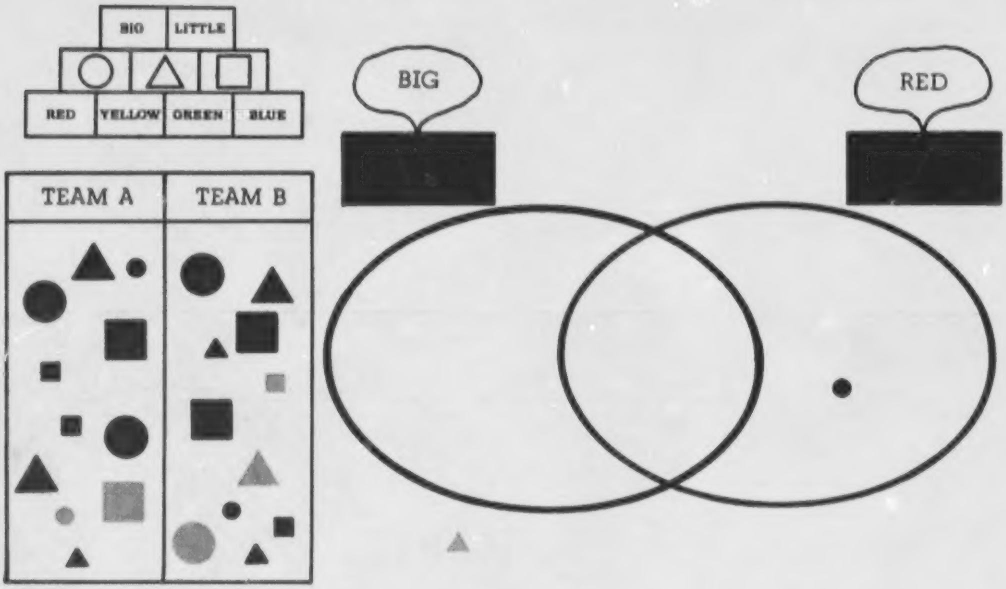
CAPSULE LESSON SUMMARY
Play the String Game with A-blocks.

MATERIALS
Teacher: A-Block String Game kit; colored chalk
Student: None

DESCRIPTION OF LESSON

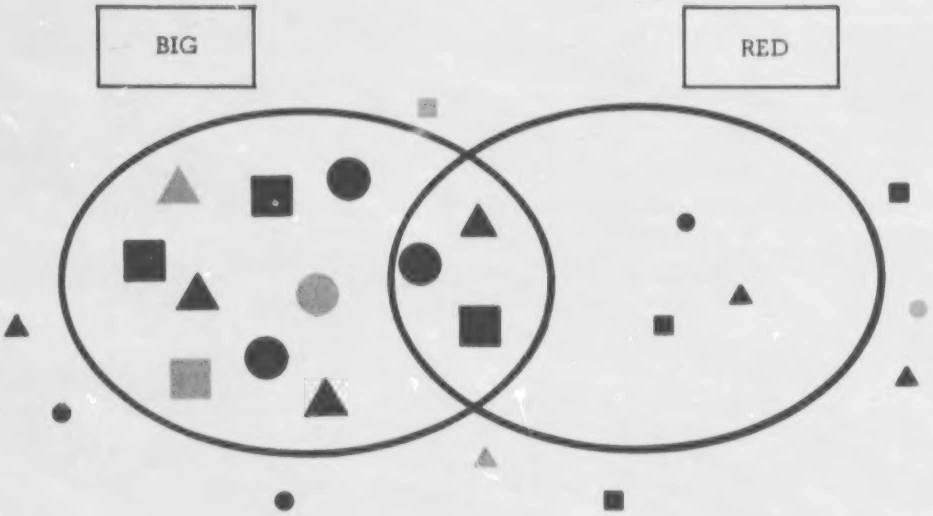
Prepare to play the String Game with A-blocks in the usual way. A suggested game with starting clues is provided below. The second illustration shows the correct placement of all pieces and may aid you in judging.

STARTING SITUATION



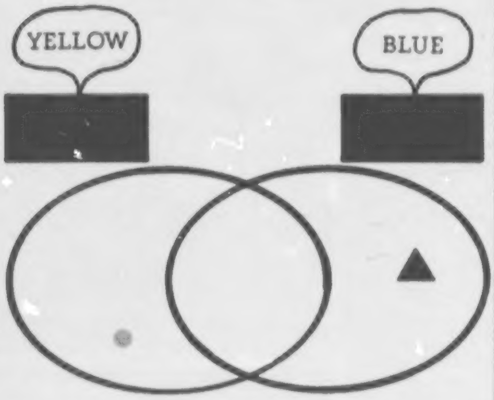
S 79

CORRECT PLACEMENT OF PIECES

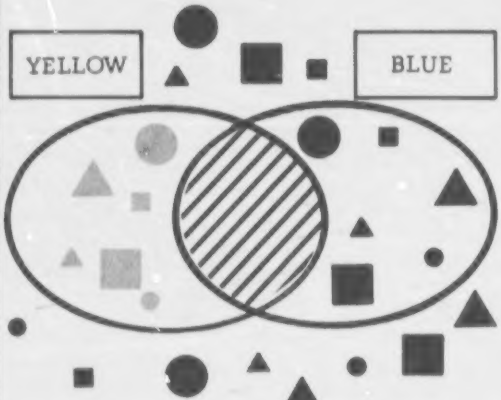


If some time remains, and the class is interested, play a second game, using the starting clues and correct placement of pieces as shown below. If some students suggest "hatching" the empty center region, proceed to do so.

STARTING CLUES



CORRECT PLACEMENT OF PIECES



S80 Adjustment Day #8

NOTE: See page 16, Section One NOTES TO THE TEACHER in CSMP Mathematics for the First Grade, Part I for a full explanation of the purpose of scheduled adjustment days.

On this day you may wish to repeat a previous lesson, either for a small group of students or for the entire class. Often the basic content of a particular lesson can be made to appear completely different by adjusting a story line and/or the numbers in a story. Consider the needs of your class in choosing lessons to repeat.

If you would like to give your students more experience with common multiples, choose two different size jumps (that is, addition functions) to use in the context of S66.2 Frogs in a Pond #2. Before the year ends, you may also wish to repeat S68.2 Introduction to Frames, to give the students more experience in completing open number sentences.

If you omitted the worksheets from any previous lesson, you may wish to distribute them on this day, after an appropriate warm-up activity. Also, if you believe some of your students can work further in "A Parade of Problems #3", you may want to allow more time for individual work. This would also be a good time to allow the students to look at the storybook "The Weird Story of 24", if you have not already done so.

You and your class have now completed CSMP Mathematics for the First Grade. We hope the students enjoyed mathematics this year and that you enjoyed teaching these lessons as much as we enjoyed developing them. Your students should now be well prepared for CSMP Mathematics for the Upper Primary Grades, during their study of which they should continue to grow and mature as mathematics students.

APPENDIX: The String Game

The String Game is used in many versions throughout the CSMP Elementary School Program. It gives students an opportunity, in a game-like atmosphere, to become familiar with the language of strings, while at the same time it involves them in the kind of reasoning that will be developed and reinforced in various contexts throughout the program.

The String Game is first played with A-Blocks (shapes), but later on in the Intermediate Grades variations which make use of numbers appear. In this appendix we provide you with the necessary information and examples to enable you to play the game using A-Blocks, and we suggest some of the various possibilities open to you when you play the game with shapes. Although only a few lessons in First Grade are scheduled for the String Game, we hope you will not feel restricted to playing the game only at these times. Also, only Variation #1 of Version A is suggested for First Grade; however, you may feel that your class is ready to play one of the more complicated variations by the end of the year.

Equipment

PLAYING BOARD

The equipment for this game may be most easily managed if you have a magnetic* chalkboard available. Many of the permanently mounted chalkboards in classrooms are magnetic, and you should test yours using one of the demonstration Minicomputer checkers. If your permanent chalkboards are not magnetic, try any portable chalkboard (grid board, etc.) that the school has available. If you do not have a magnetic chalkboard available, you can use your regular chalkboard.

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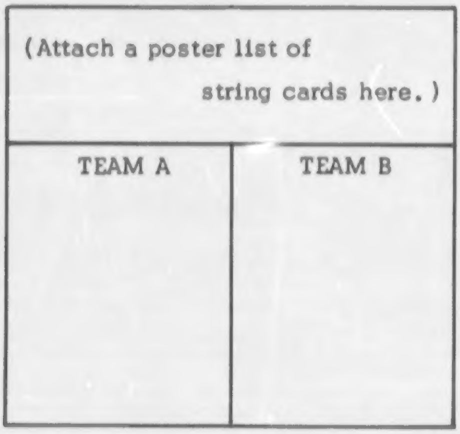
* Strictly speaking the chalkboard itself is not magnetic, but rather magnet-sensitive; i.e., magnets adhere to it. However, for simplicity we call such boards "magnetic".

TEAM BOARD

The Team Board is divided into three regions as illustrated below.



a) Magnetic: If you do locate a magnetic chalkboard, you will also need a magnetic or metallic Team Board. With a large magnetic chalkboard, say at least three chalkboard squares, the Team Board could be drawn on the chalkboard. However, if you have a relatively small (portable) magnetic chalkboard, then you will need to obtain a sheet of metal (minimum size: 60 cm by 80 cm) or locate a convenient metallic surface in the classroom such as the side of a file cabinet on which to put the Team Board. In this case, draw the markings for the three regions of the Team Board on a large sheet of (easel pad) paper and tape this paper to your metallic surface.

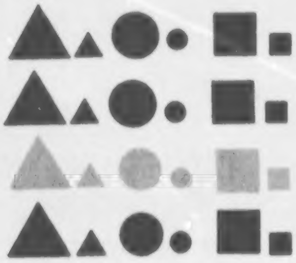
b) Non-magnetic: If you do not have a magnetic chalkboard available for the playing board, then your Team Board could be a large piece of poster board (minimum size: 60 cm by 80 cm). Make the markings for the three regions of the Team Board with a heavy felt-tip pen.

GAME PIECES and STRING CARDS

One set of game pieces and string cards are needed for each version of the game. A list of the string cards (A-Blocks String Game Poster) is to be attached to the upper section of the Team Board - it is a constant reminder during the game of the possible labels for the strings.

Game Pieces

String Game
with
A-Blocks



String Cards

RED	YELLOW	GREEN	BLUE
NOT RED	NOT YELLOW	NOT GREEN	NOT BLUE
○	△	□	BIG
NOT ○	NOT △	NOT □	LITTLE

Game pieces, string cards, and the poster list of the string cards can be found in the A-Blocks String Game Kit.

a) Magnetic: You can magnetize the game pieces (A-Blocks) by sticking a small piece of magnetic material to the back of each one. (Magnetic material is included in the A-Blocks String Game Kit, or it is available in many hobby and notions departments of stores.) Similarly, you can magnetize string cards by sticking a small piece of magnetic material to the front of each card, taking care not to obscure what is written thereon.

b) Non-magnetic: Game pieces can be attached to the Team Board by means of loops of masking tape stuck to the backs. A string card should have a loop of masking tape stuck to the front so that what is written on the card is not obscured. With this type of equipment, you should prepare yourself for running repairs by having sufficient masking tape available so that if a loop of tape loses its stickiness, it can be replaced on the spot. An alternative is to use a small wad of a plastic caulking compound (Rope Caulk or Mortite, for example) in place of the loop of masking tape. This material will maintain its stickiness over a much longer period of time.

Preparation for the Game

Draw two (or three, depending on which variation you are using) large, overlapping strings on the playing board using two (or three) different colors. Next to each of these strings attach one string card face-down. Locate the Team Board conveniently near to the playing board. Share the game pieces between the two sections of the Team Board labeled "TEAM A" and "TEAM B" by randomly placing one-half of the pieces in one section and the remainder in the other section. Divide the class into two teams using whatever method is acceptable to your class; e.g., boys vs. girls; rows 1, 2, 3 vs. rows 4, 5, 6; etc. Call one team "Team A" and the other "Team B". Before any student takes a turn, correctly place an equal number (at least one) of each team's game pieces in the string picture. This removes from the first players the necessity of operating on the basis of pure guesswork. You can influence how long the game will take by the number of pieces you place in the string picture before the game begins.

Object of the Game

Each team tries to place all of its game pieces correctly (according to the face-down string cards) in the string picture. The winning team is the one that first places all of its game pieces correctly and identifies the face-down cards correctly, after playing according to the rules.

Rules of the Game

1) The game is played in silence. This is to avoid one student telling another where to play a certain piece, or what the strings are for. Each student should have the opportunity to analyze the game alone. Infringement of this rule by anyone is penalized by the talker's team losing its next turn.

2) The teams alternate, and the members take turns within each team. A player comes to the board and selects a piece from his or her team's collection to place in one of the regions of the string picture.

3) You are the judge. If the piece is correctly placed, say "yes". The piece remains in the string picture and the player immediately has a second turn (no player may have more than two consecutive turns). If the piece is incorrectly placed, say "no". The player returns the piece to the team's unplayed collection and play passes to the other team.

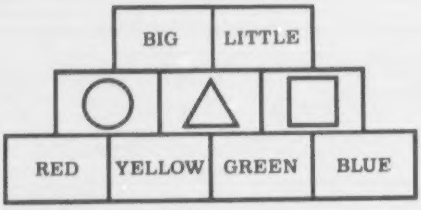
   As an aid in judging, prepare a "crib-sheet" showing the correct position of each game piece or at least reminding you of what is on the face-down cards. If at any time you discover that you have made an error, say so immediately and rectify the mistake. Either move an incorrectly placed piece whose position you had approved to its correct region or replace in the string picture a correctly placed piece that had been rejected because you had disapproved its position.

4) When a team has correctly placed all of its pieces, the player who placed the last piece may thereupon attempt to identify each of the string cards. If these are all correct, the team has won. If a mistake is made (even if it is only in the case of one of the string cards), simply indicate that the identification is incorrect and let the game continue.

5) If a team has exhausted its stock of game pieces and the strings have not been identified, that team continues on its turn to attempt to identify the strings, while the other team works to place its game pieces.

Version A: The String Game with A-Blocks

This simplest version of the game uses twenty-four A-Blocks as game pieces and only nine string cards.

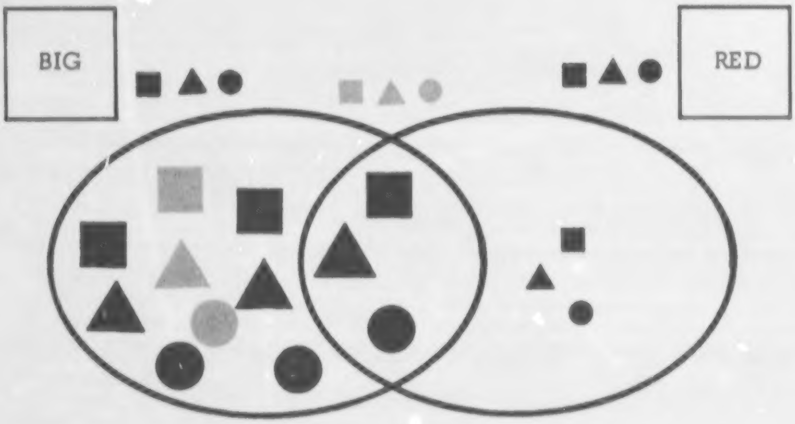


This list of string cards should be posted on the board or attached to the game board.

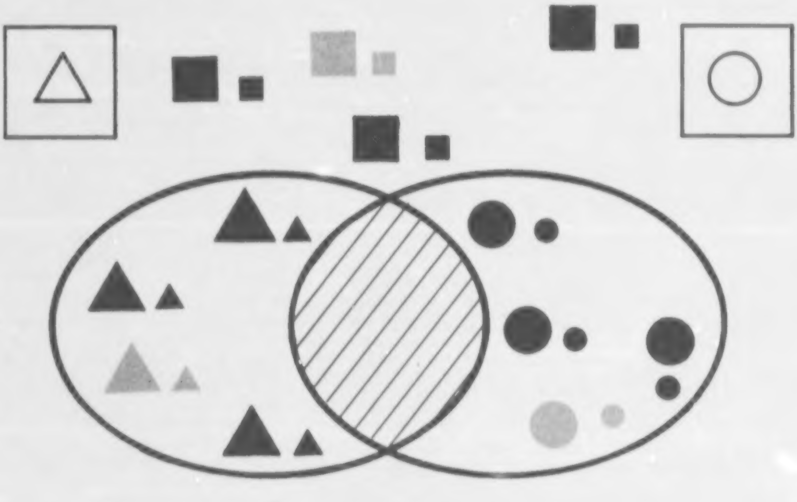
We provide here several example "crib-sheets" for variations of the game with two and with three strings.

Variation #1 : Two Strings

Example 1 : No Empty Regions

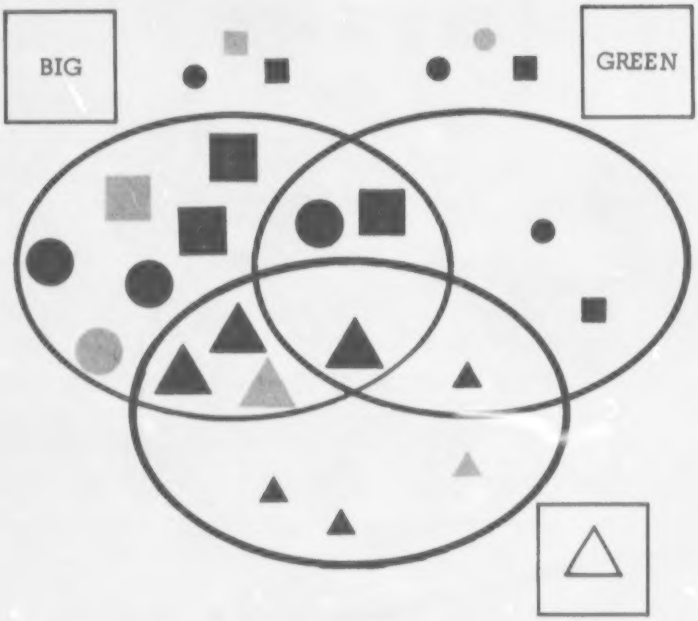


Example 2 : One Empty Region

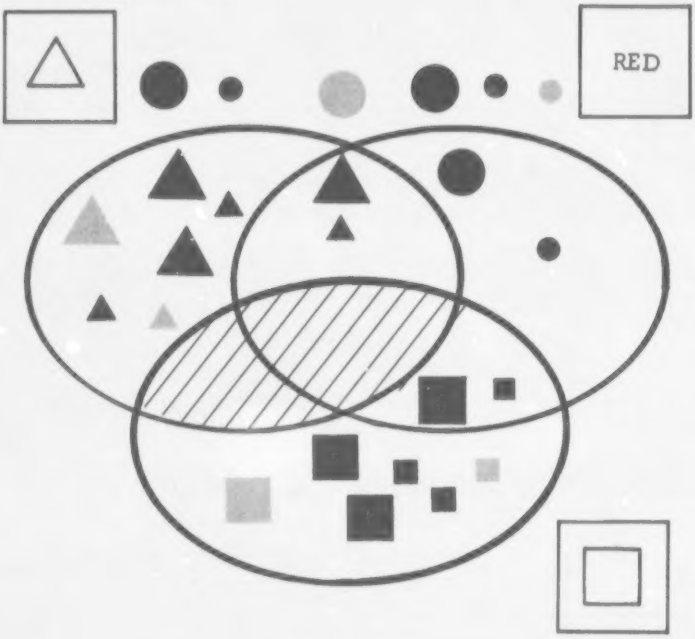


Variation #2: Three Strings

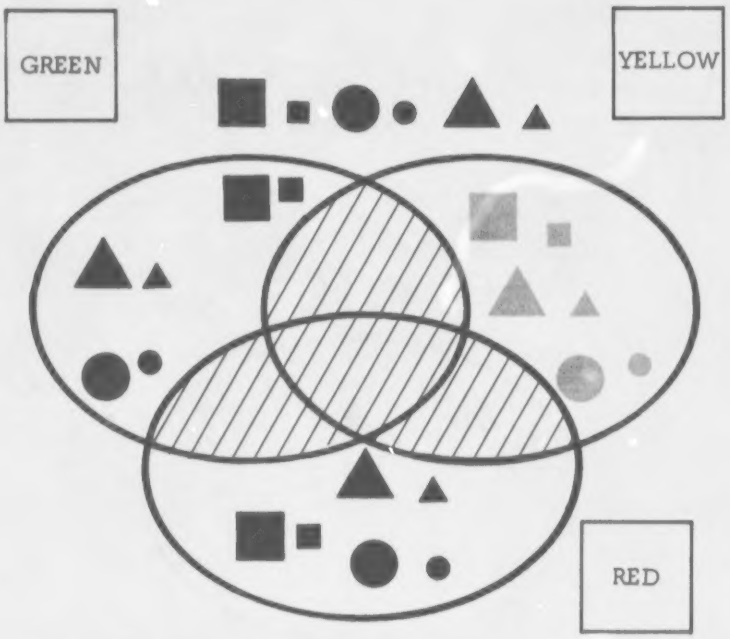
Example 1: No Empty Regions



Example 2: Two Empty Regions



Example 3: Four Empty Regions



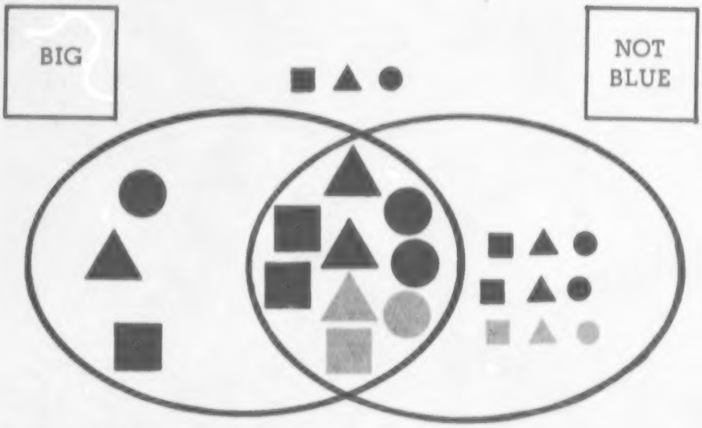
Version B: The String Game with A-Blocks, using "Not" Cards

A more complicated version of the game with A-Blocks uses all sixteen of the string cards. A list of all sixteen string cards should be posted or attached to the Team Board.

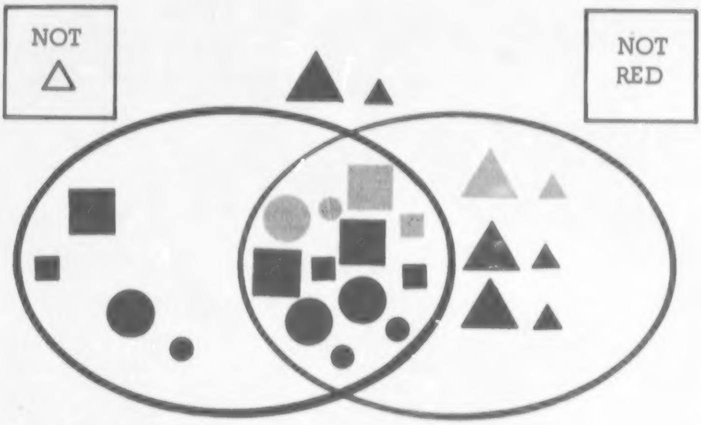
NOTE: Since "NOT BIG" and "LITTLE" describe exactly the same A-Blocks (and similarly for "NOT LITTLE" and "BIG"), such a "not" card is redundant. If a student questions why we do not include these possibilities, let the class discuss why they are unnecessary.

We provide here several example "crib-sheets" for this version of the String Game played with two strings.

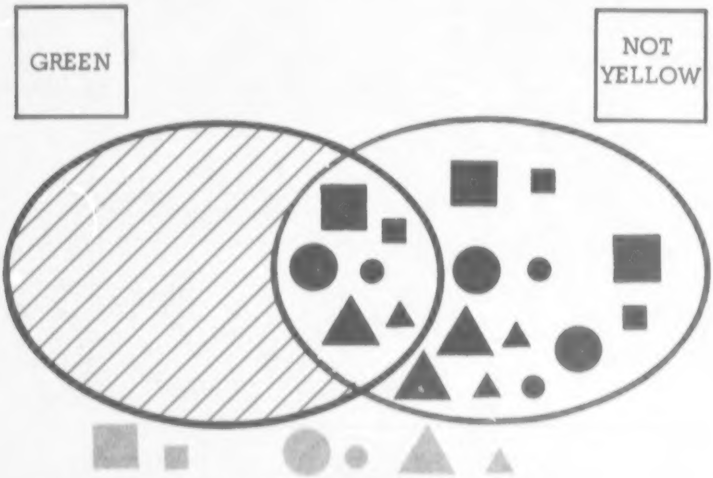
Example 1: No Empty Regions



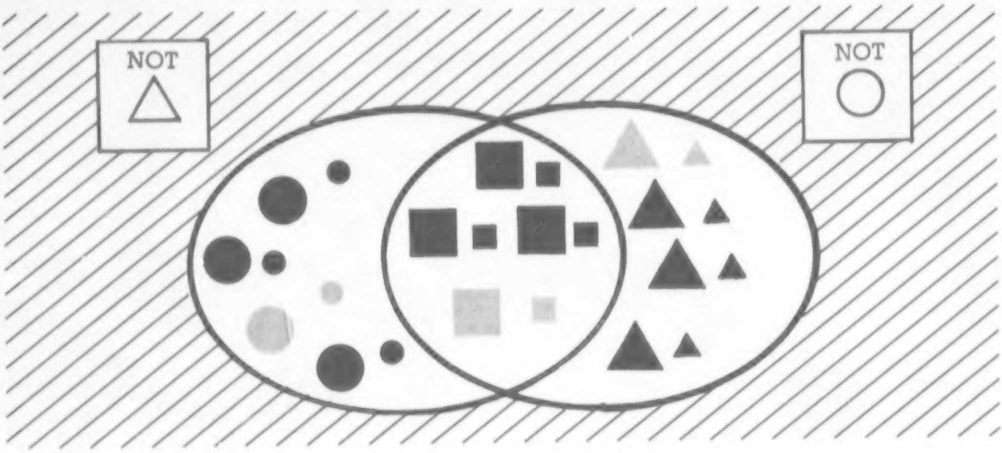
Example 2: No Empty Regions



Example 3: One Empty Region



Example 4: One Empty Region



Of course, by hatching the "outside" region of the diagram we mean to indicate that no game pieces can be placed there correctly. Strictly speaking, that region is not empty because, for example, the number 50 is in the outside region.

You should be warned that the "NOT" version of the game played with three strings is almost impossible to judge without a "crib-sheet" and is correspondingly difficult to play. Hence you would be well-advised to avoid it until such time as you think the two-string version is no longer challenging enough for the majority of your students.

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Comprehensive School Mathematics Program
CEMREL, Inc.
Final Experimental Version
1-28401

CSMP Mathematics for the First Grade
Part II

Name

Worksheets

WHAT'S IN THIS BOOK?

This book contains all the worksheets a student will need for Part II of the CSMP First Grade Program. Worksheets are labeled with the same letter and number as the lessons with which they are used. If the day-by-day schedule of lessons for first grade is followed, worksheets appear here in the order in which they are used during the semester.

HOW DO YOU REMOVE PAGES?

Step 1: Find the worksheet you want. The number of each worksheet is in the top right corner of the page.

Step 2: Fold and crease the page along the perforation line.

Step 3: With your left hand index finger and thumb, press down firmly to the left of the perforation line and along the center fold, starting at the top of the booklet.

Step 4: With your right hand, hold the top right corner of the page and tear along the perforation line. Follow the tear with your left hand holding down the center fold.

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Comprehensive School Mathematics Program
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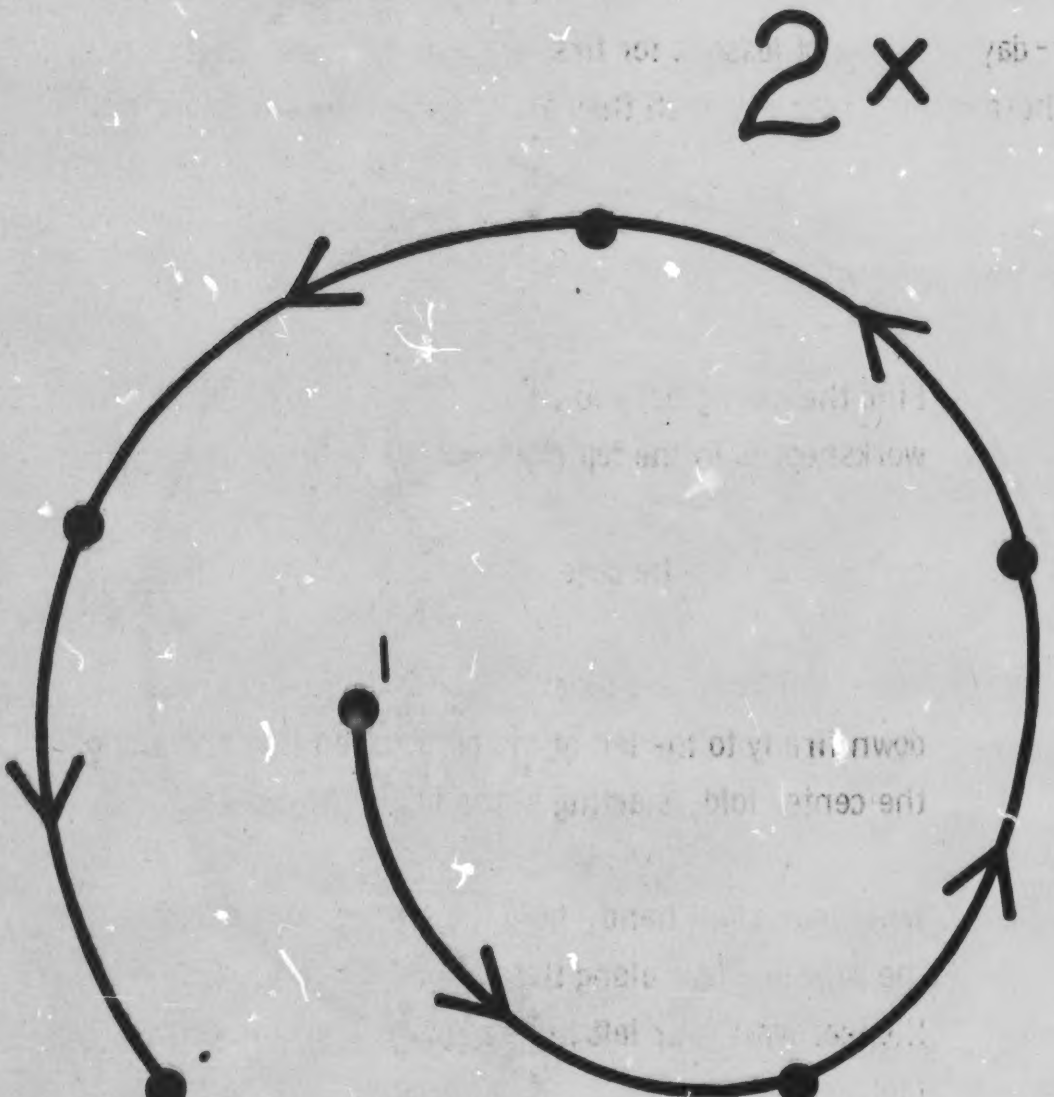
Name

S 2.2 *

Label the dots.

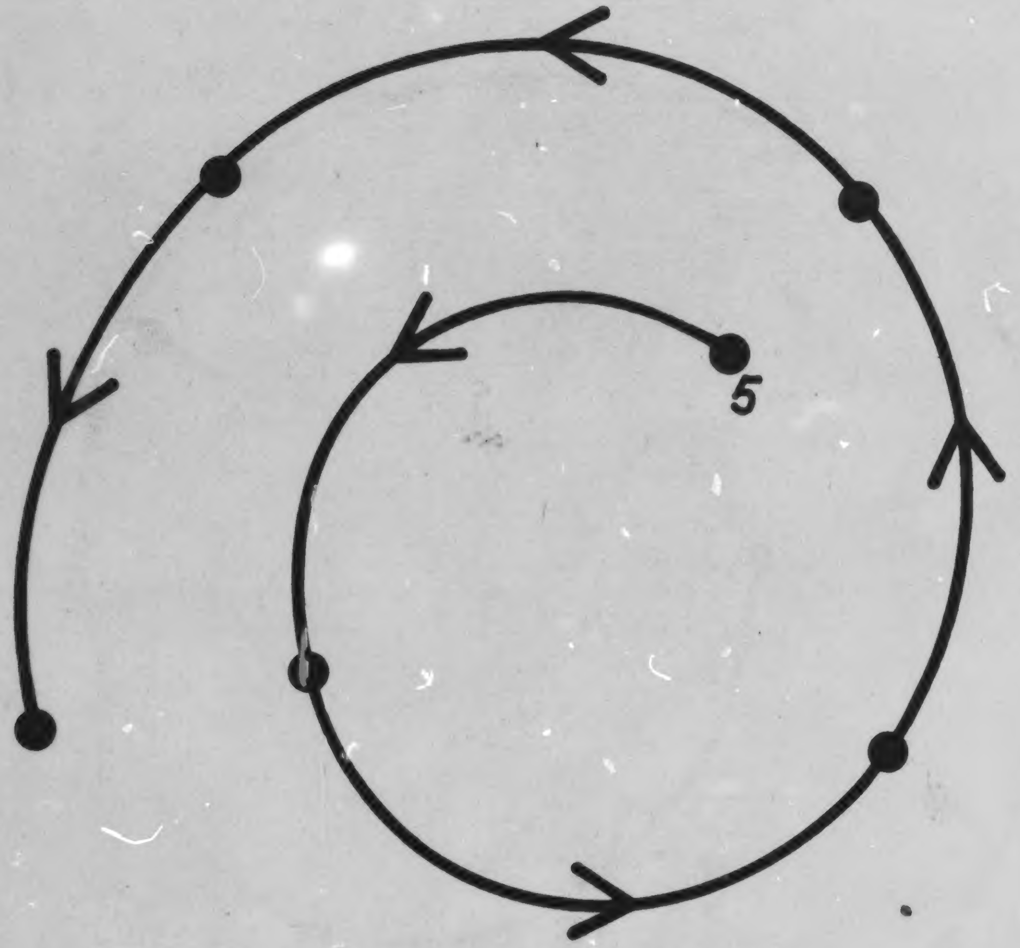


Name ______________________________

S 2.2 **

Label the dots.

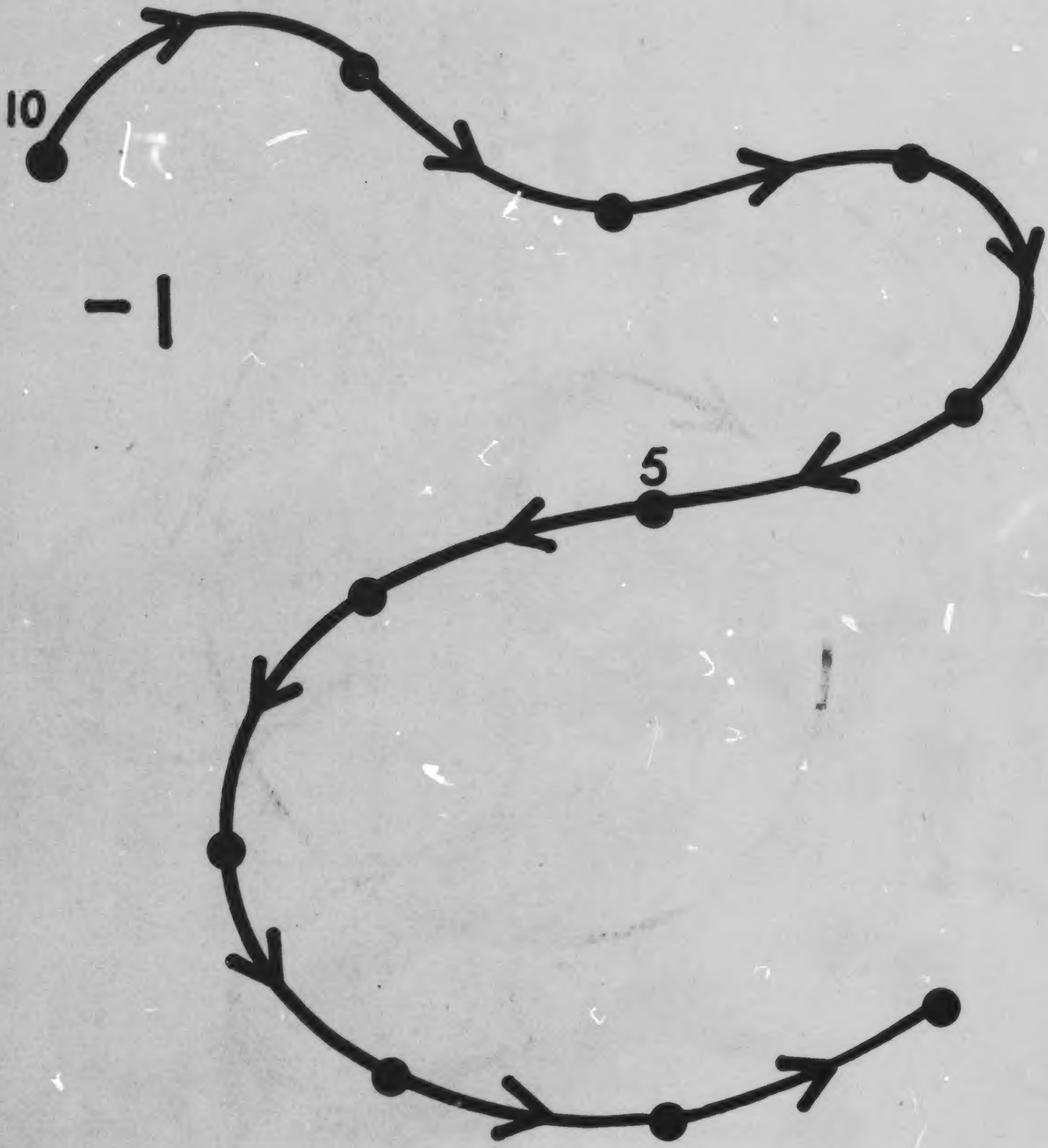
2x



Name ________________________________

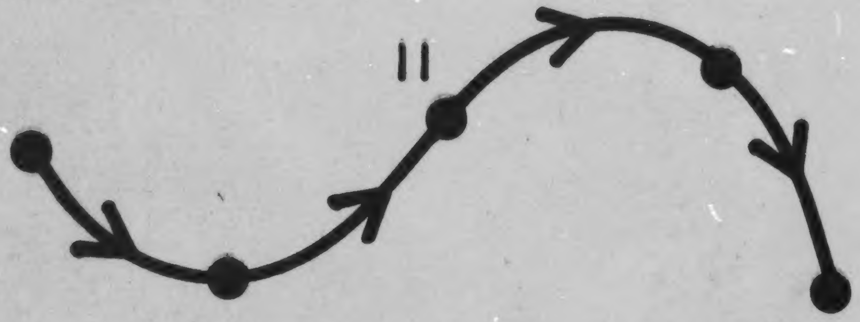
S 3.2 *

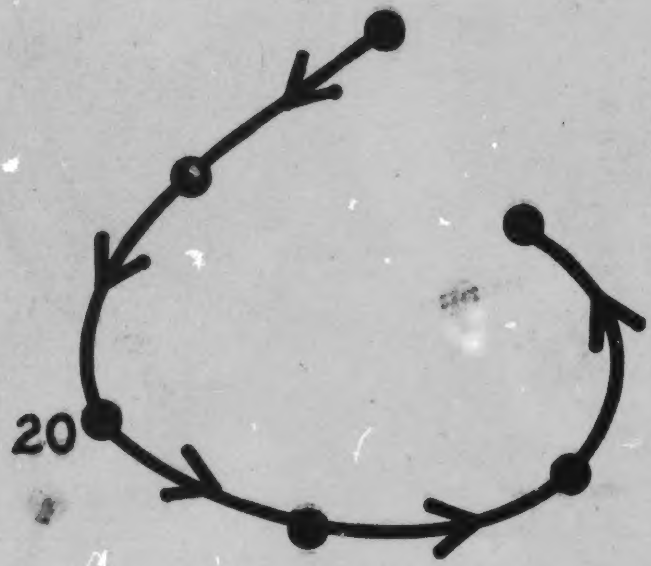
Label the dots.

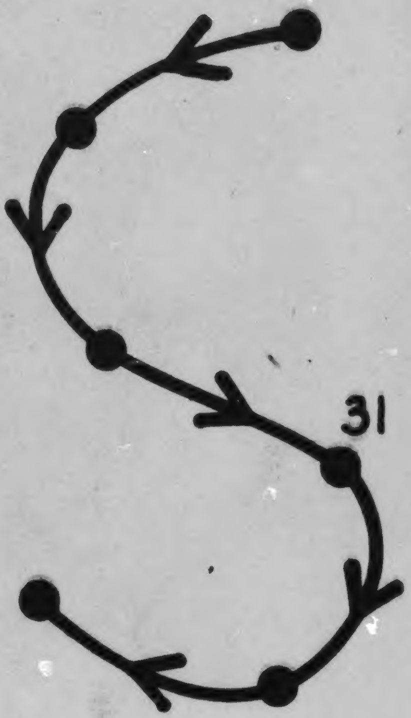


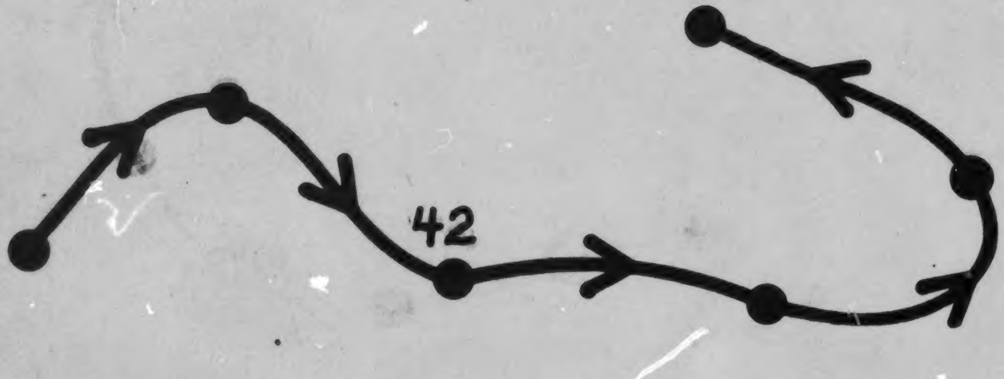
Label the dots.

-1





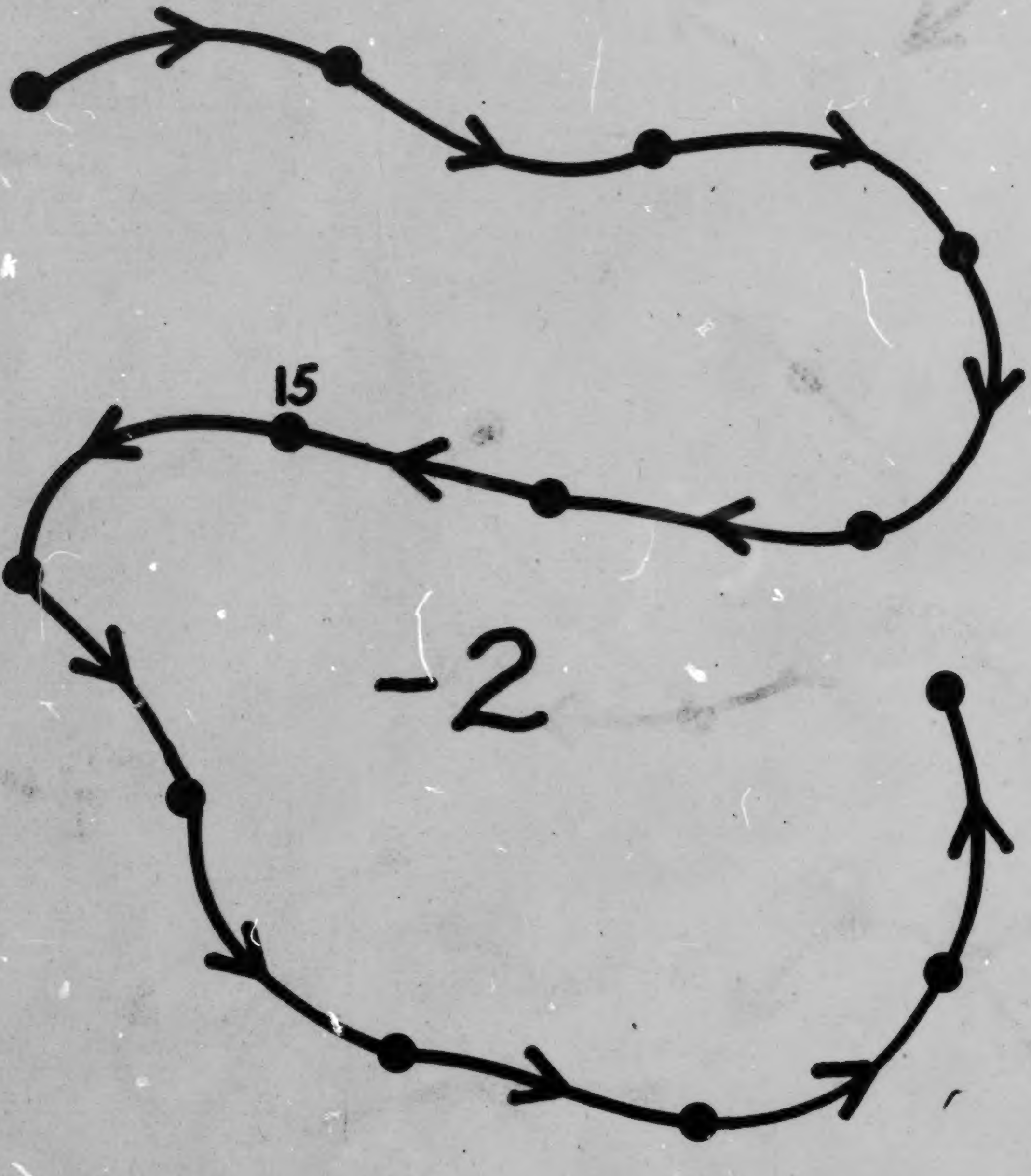




Name ______________________

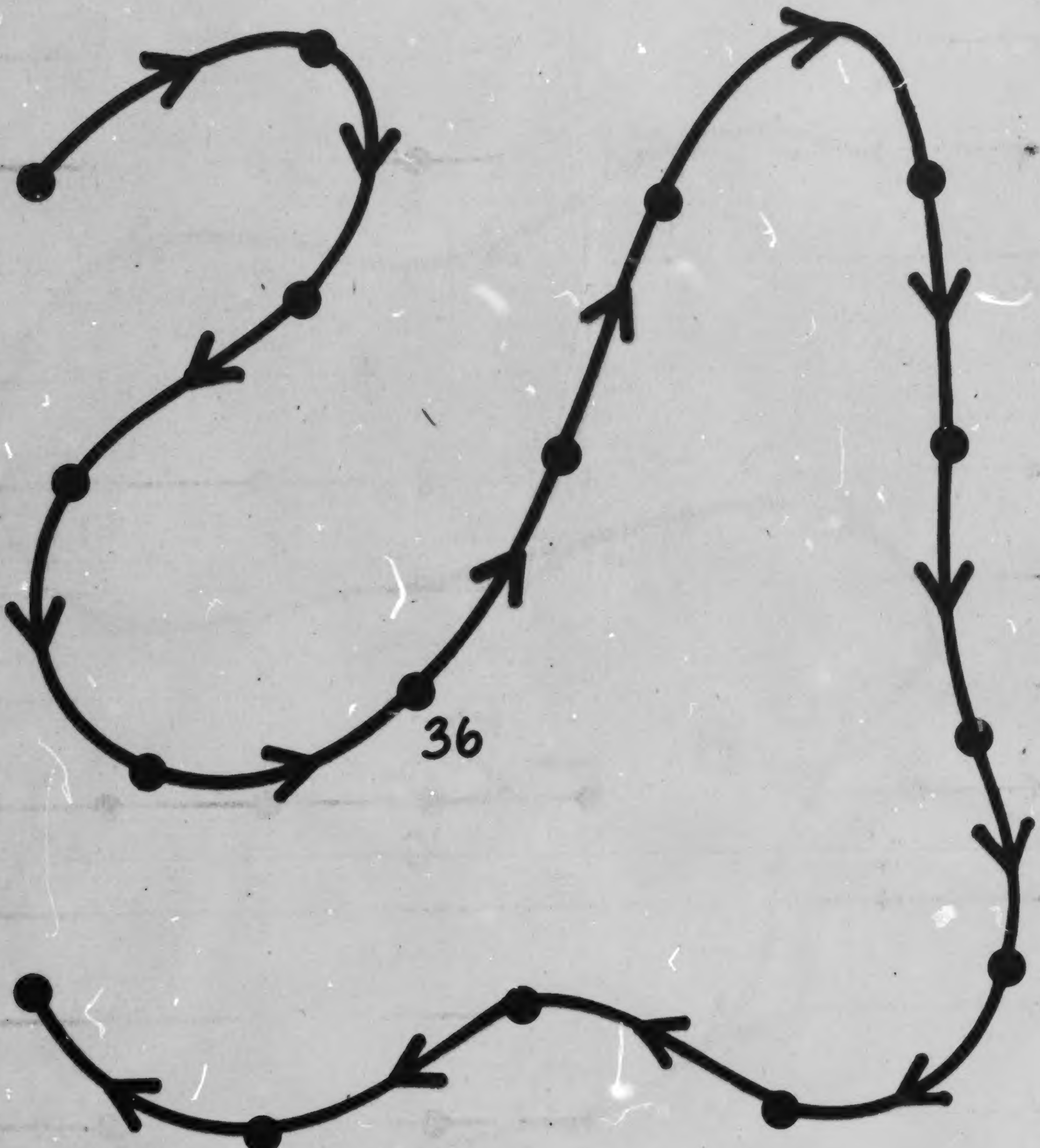
S 3.2 **

Label the dots.



Label the dots.

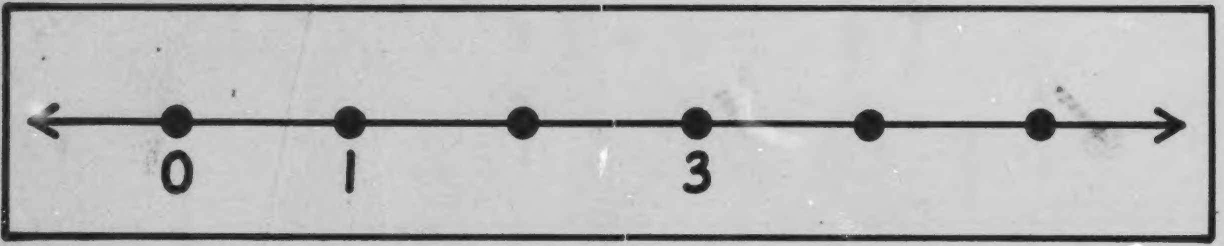
-3

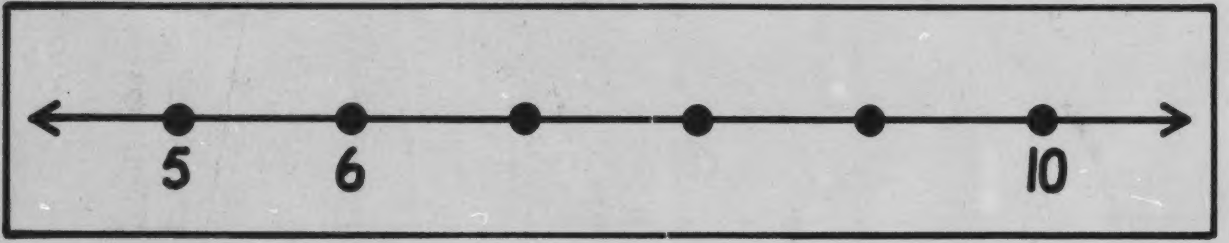


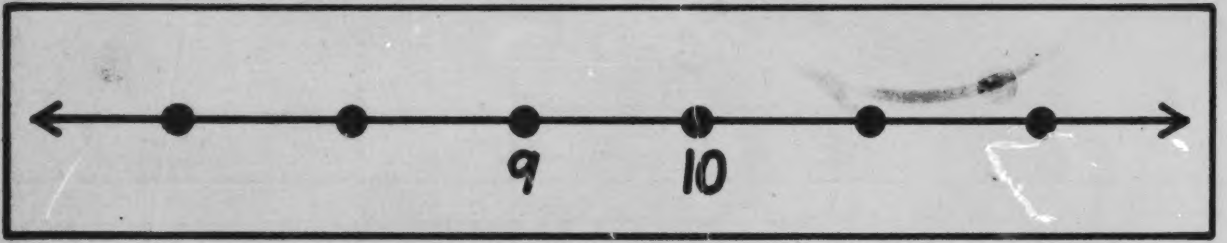
Name ______________________________

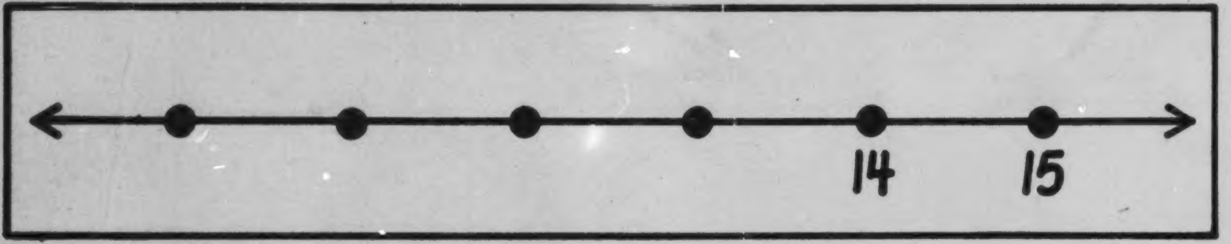
S 5.2 *

Label the dots on these number lines.





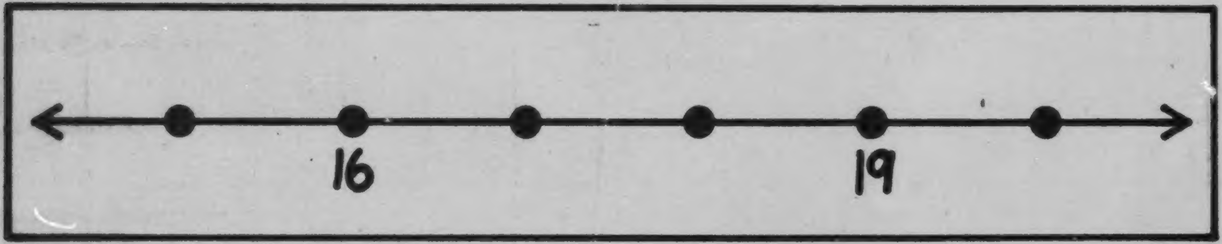


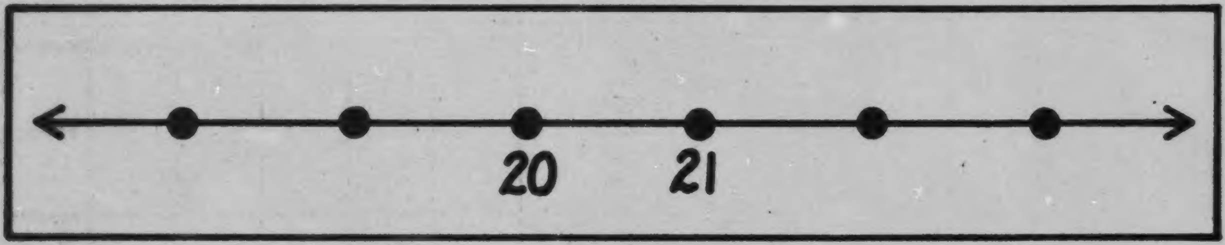


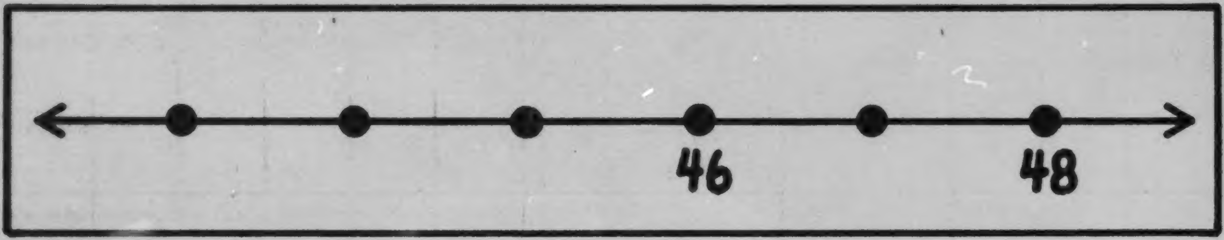
Name ______________________________

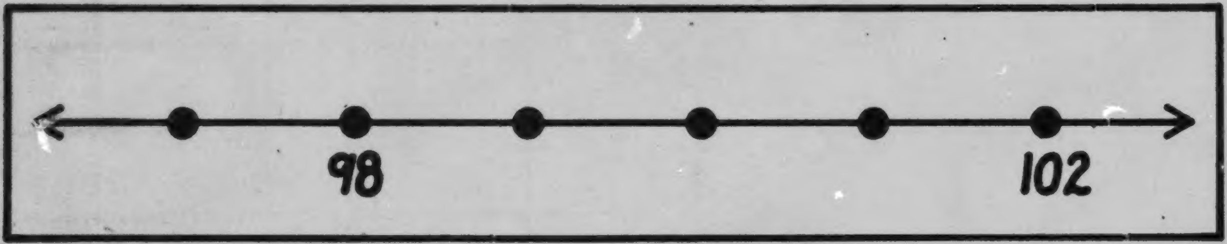
S 5.2 **

Label the dots on these number lines.



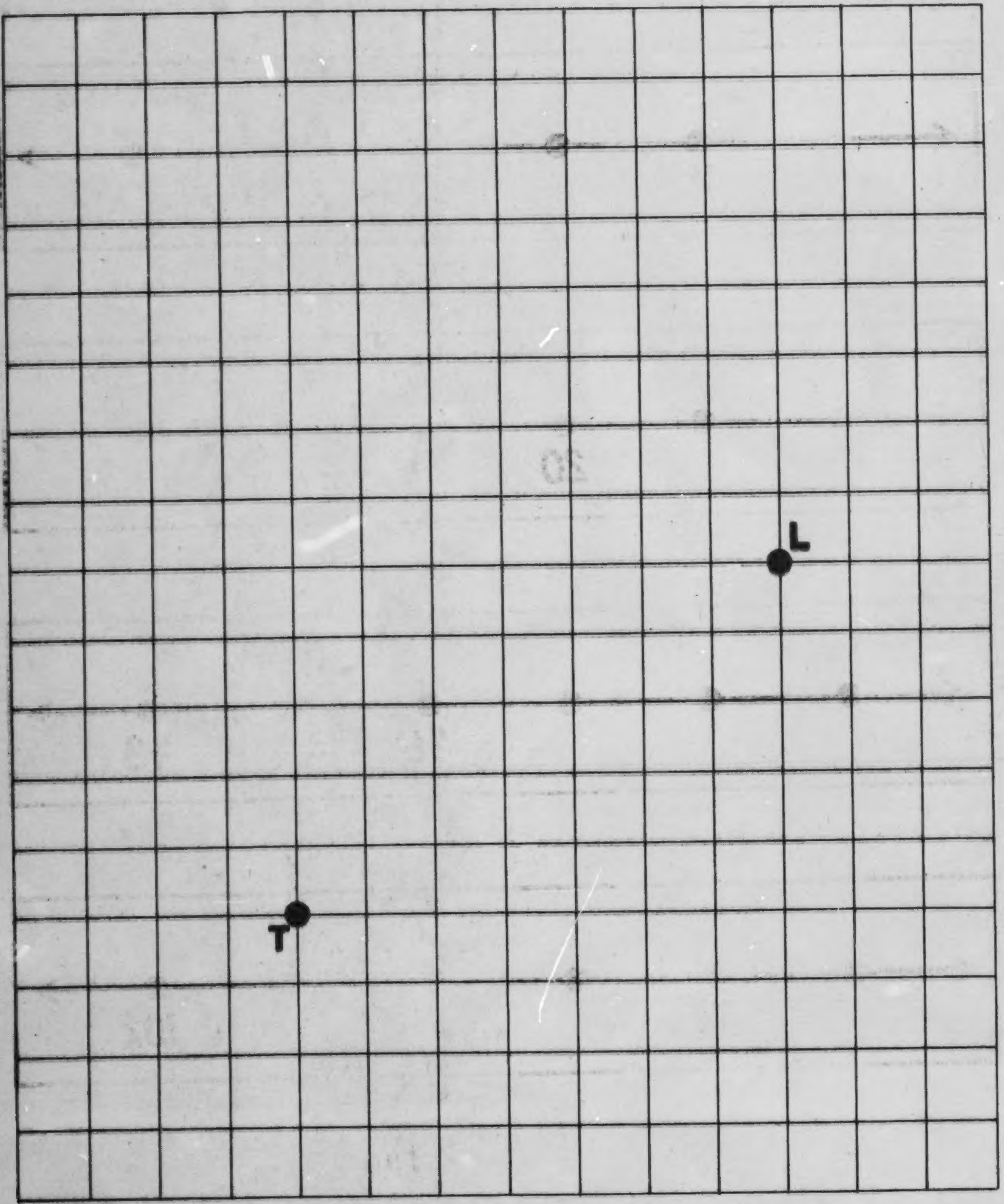


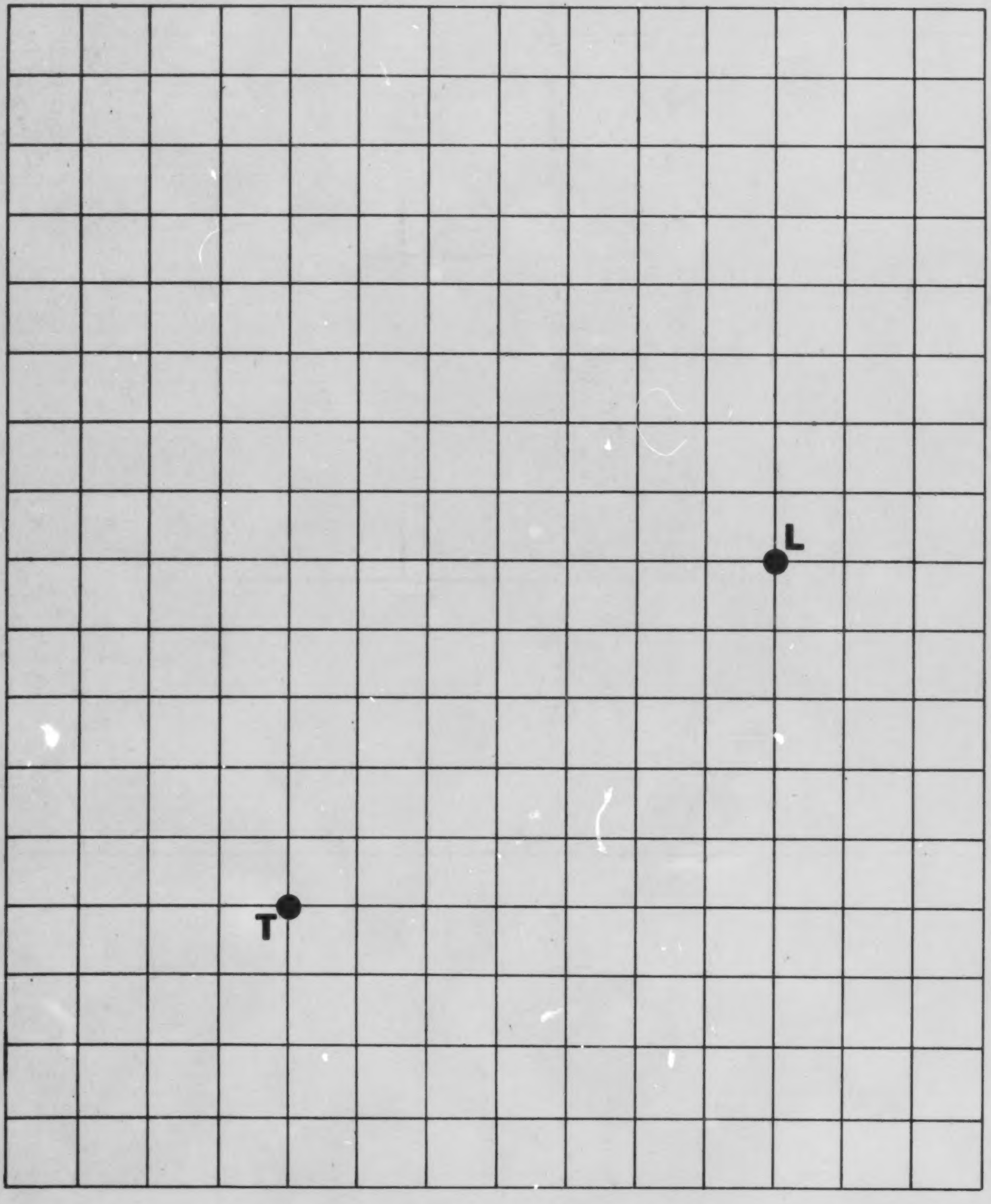




Name

S 9.2




L
T

Name ______________________________

S 13.2 *

8	3	4
1	5	9
6	7	2

Is this a magic square ? ________

Name ______________________________

S 13.2 **

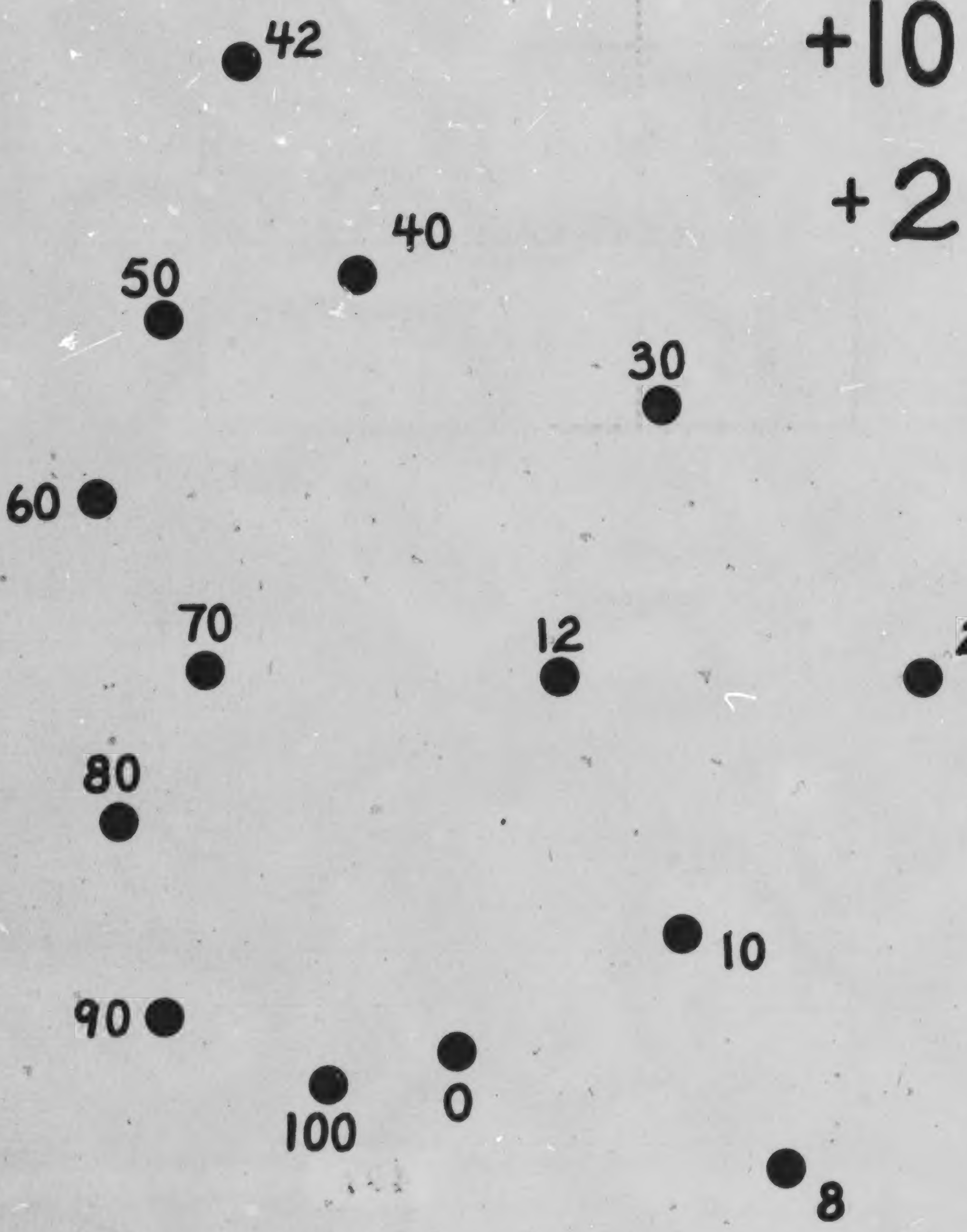
1	8	9
6	10	2
11	0	7

Is this a magic square ? __________

Name ____________________

S 14

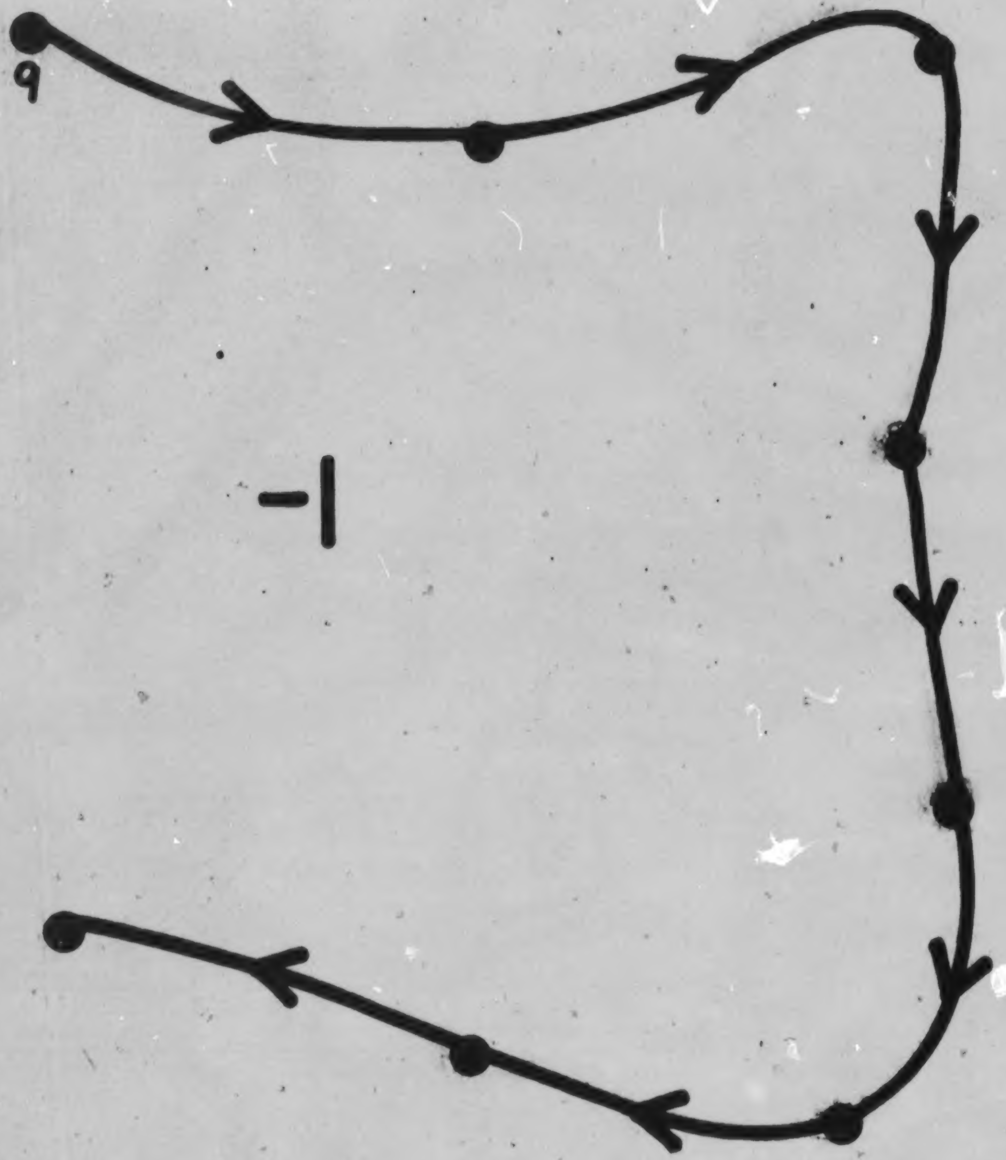
Draw all the **+10** and **+2** arrows.



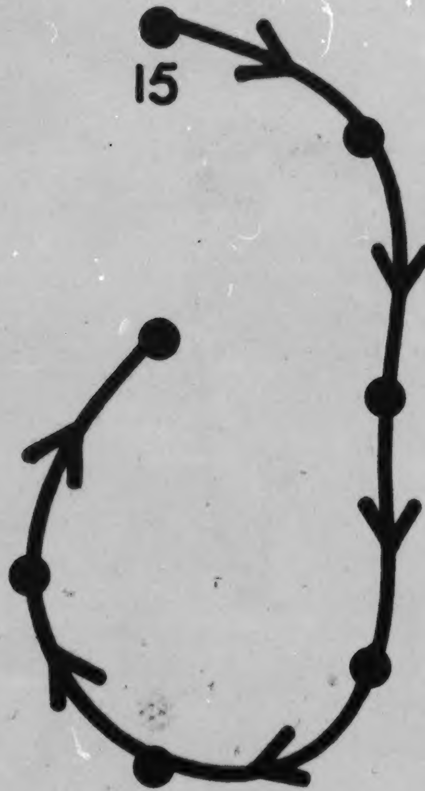
Name ______________________

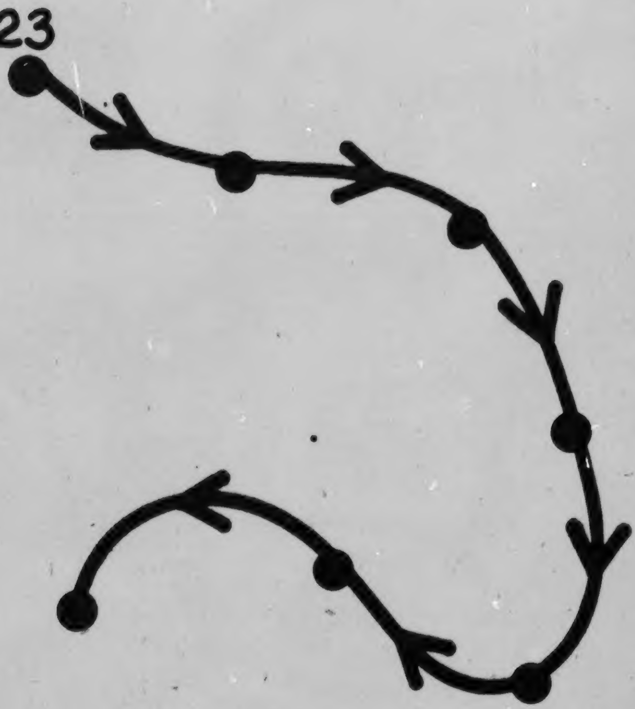
S 16.2 *

Label the dots.

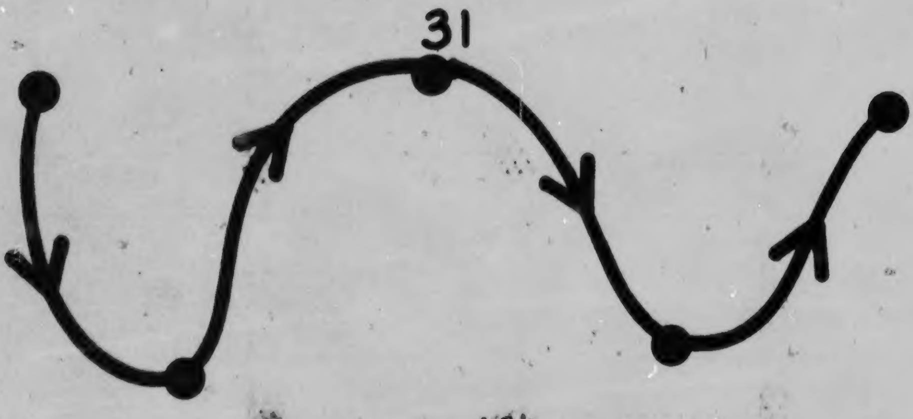


Label the dots.



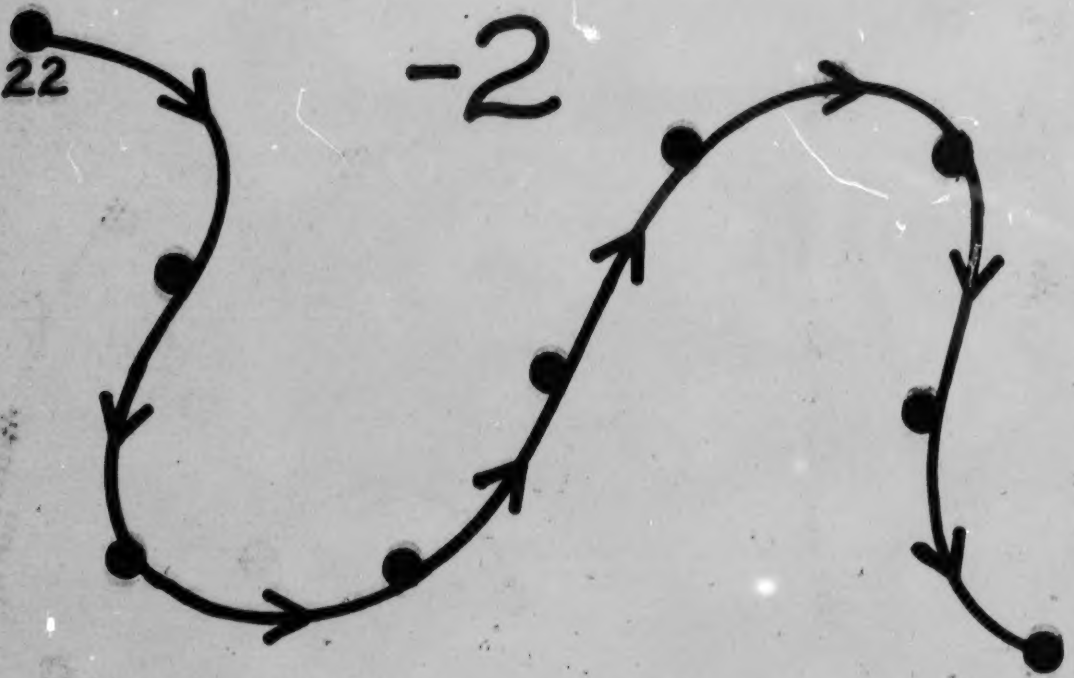


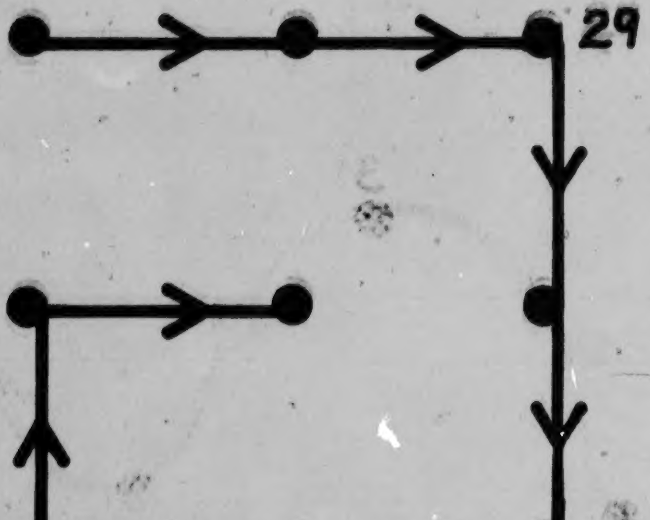
-1



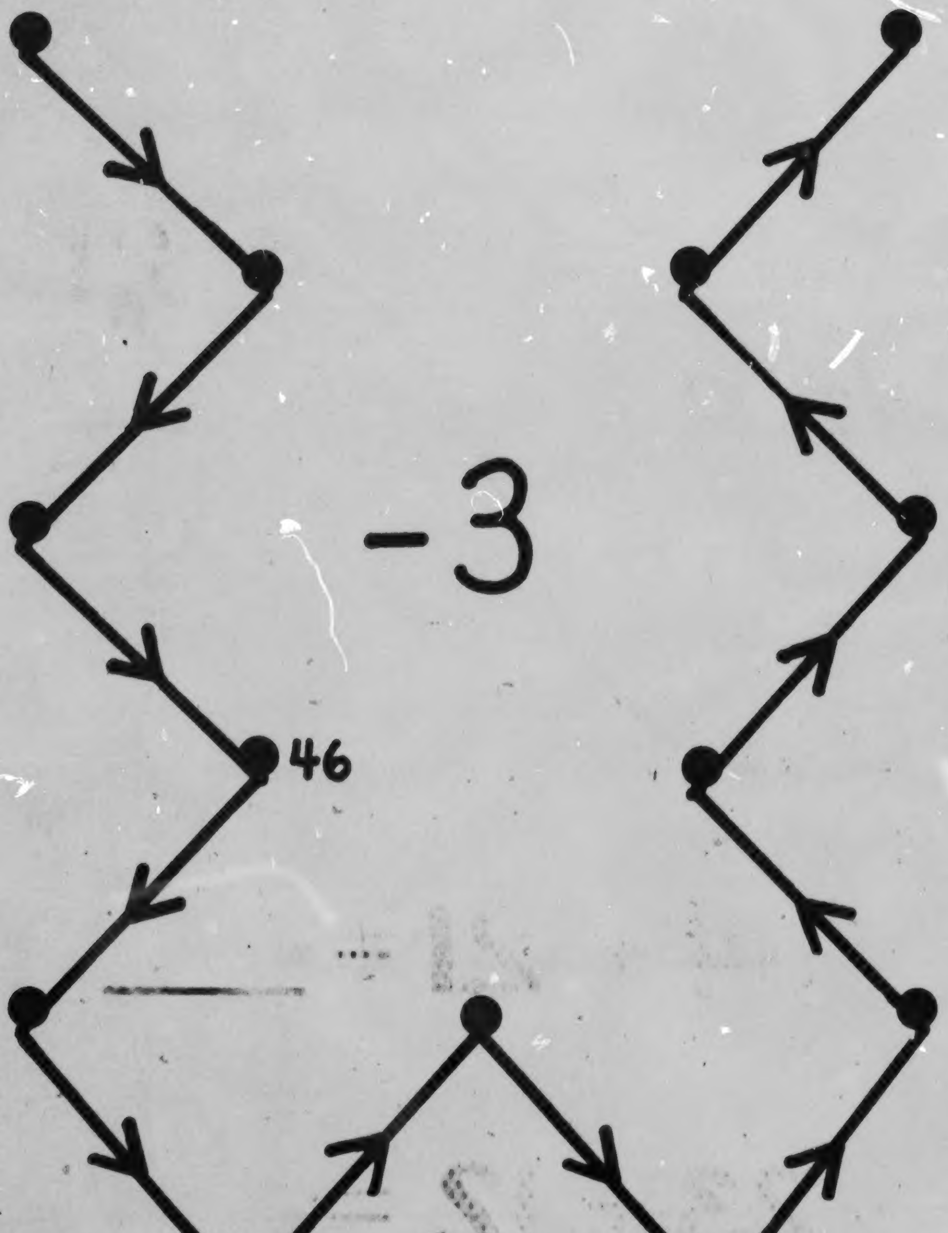
Name ______________________ S 16.2 **

Label the dots.





Label the dots.



Name ______________________

S 19.2 *

Complete.

$$\begin{array}{r} 11 \\ +\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} 21 \\ +\ 8 \\ \hline \end{array}$$

14 + 21 = ____

23 + 12 = ____

6	1	8
7	5	3
2	9	4

Is this a magic square ? ________

Name ______________________________

S 19.2 **

8	3	10
9	7	5
4	11	7

Is this a magic square ? ________

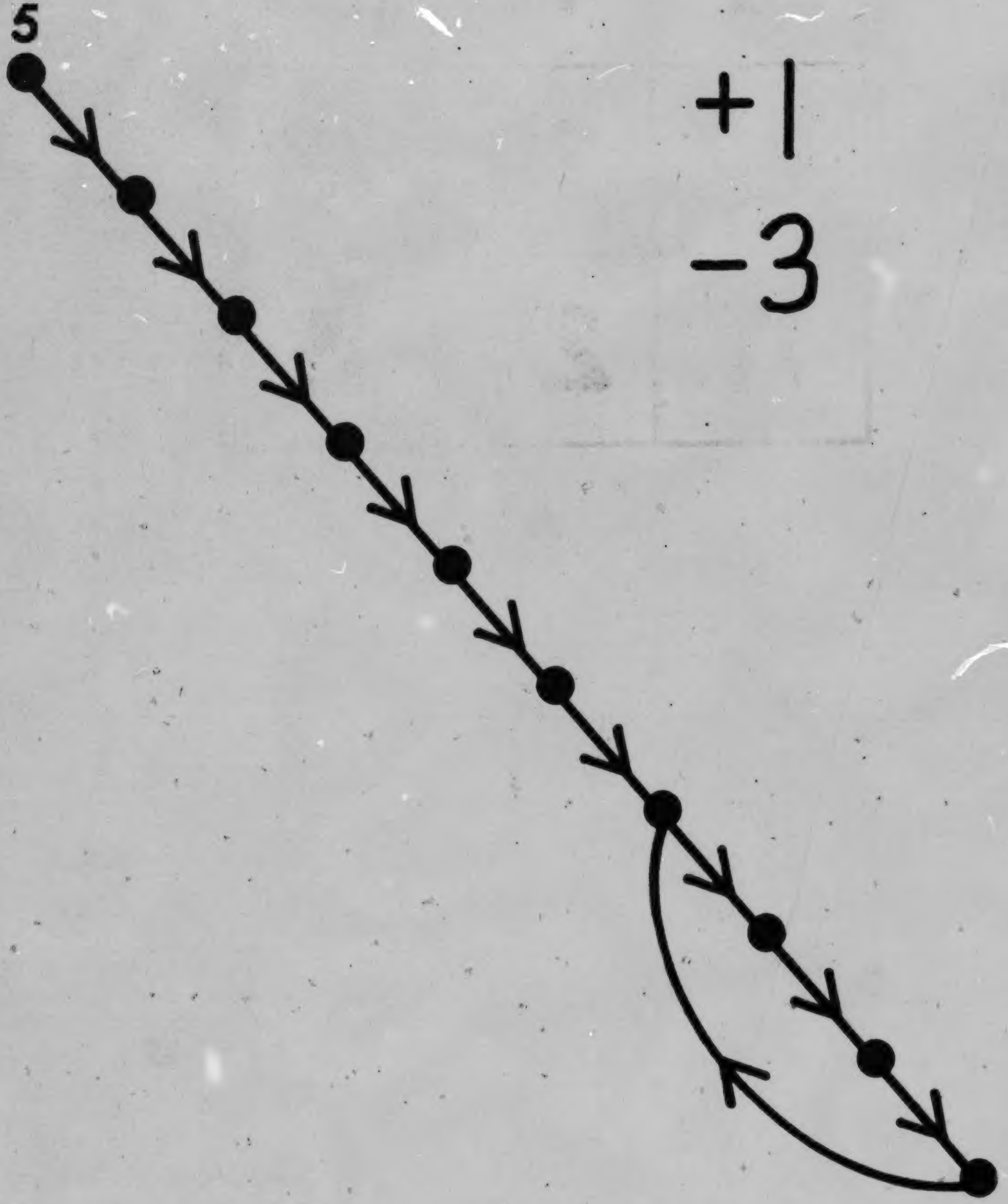
21	16	23
22	20	18
17	24	19

Is this a magic square? ________

Name ______________________________

S 21.2 *

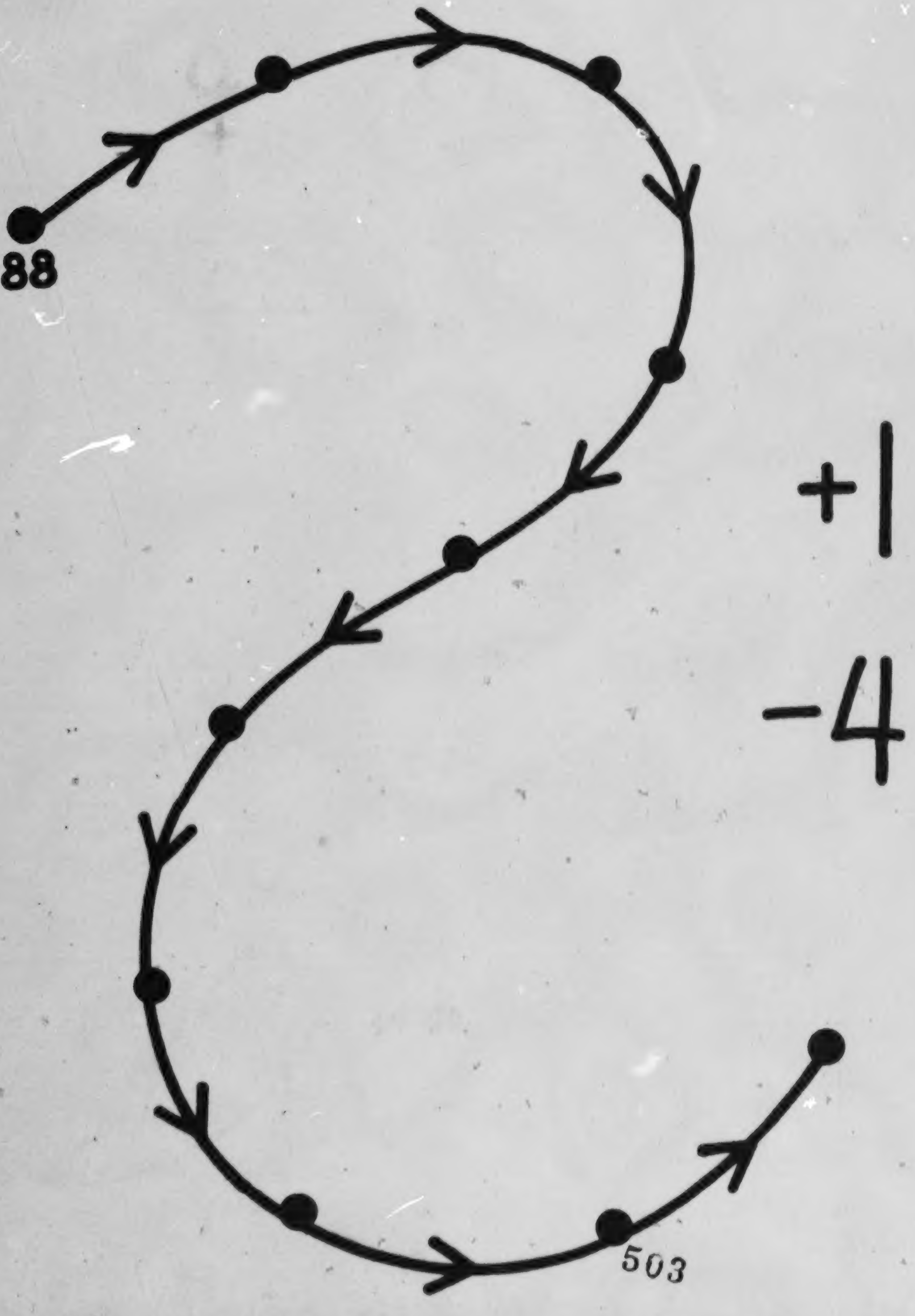
Label the dots. Draw all the missing −3 arrows.



Name ______________________________

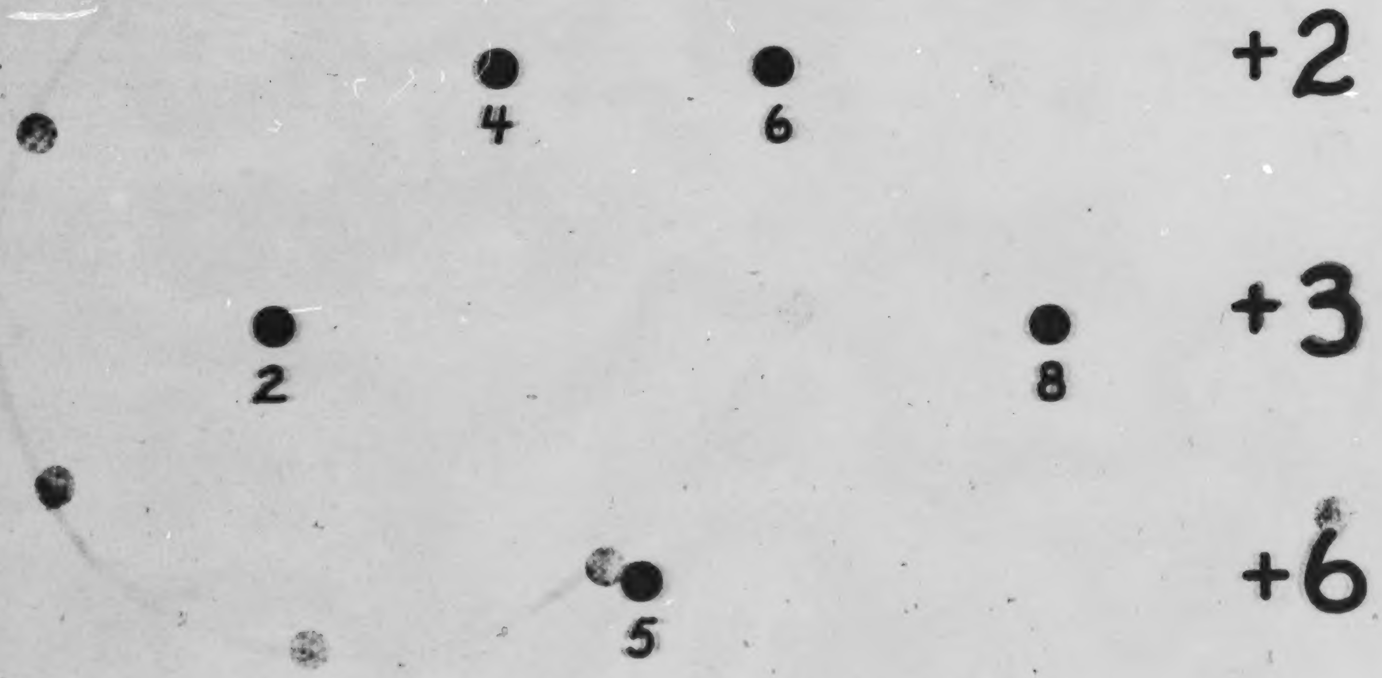
S 21.2 **

Label the dots. Draw all the missing -4 arrows.



Name ______________________

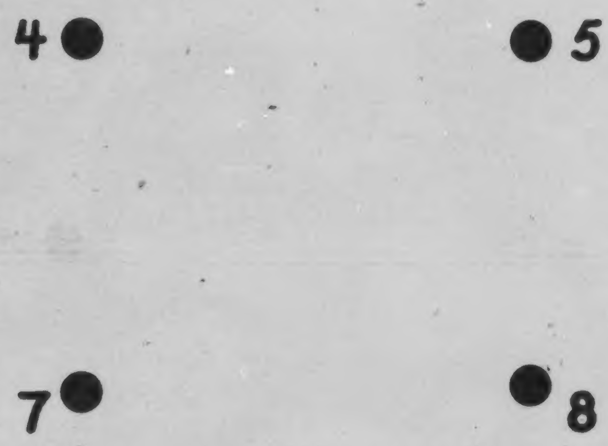
Draw all the missing arrows.



S 26.2 *

Name ______________________

Draw all the missing arrows.



+1

+2

+3

+4

S 26.2 **

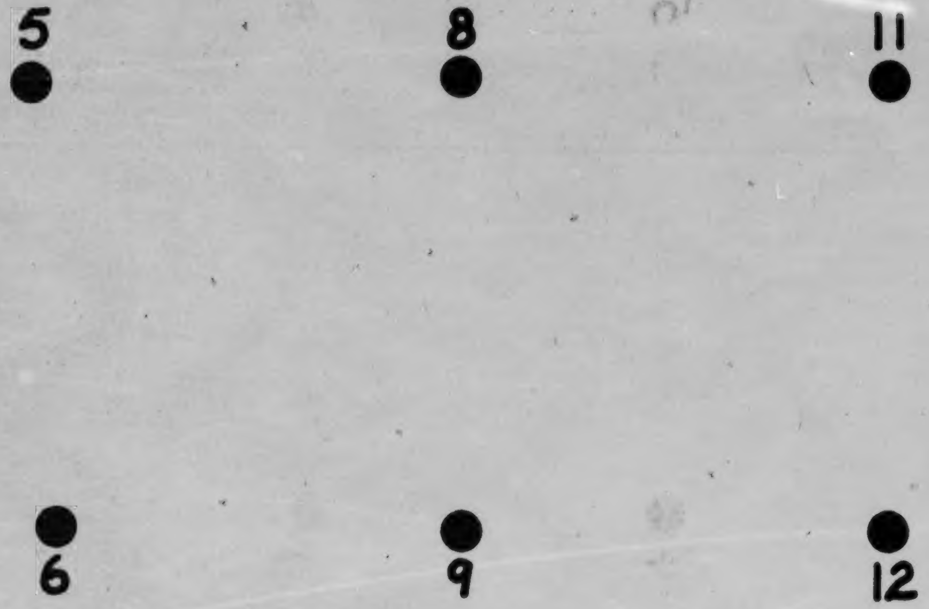
Name ____________________

S 26.2 ***

Draw all the missing arrows.

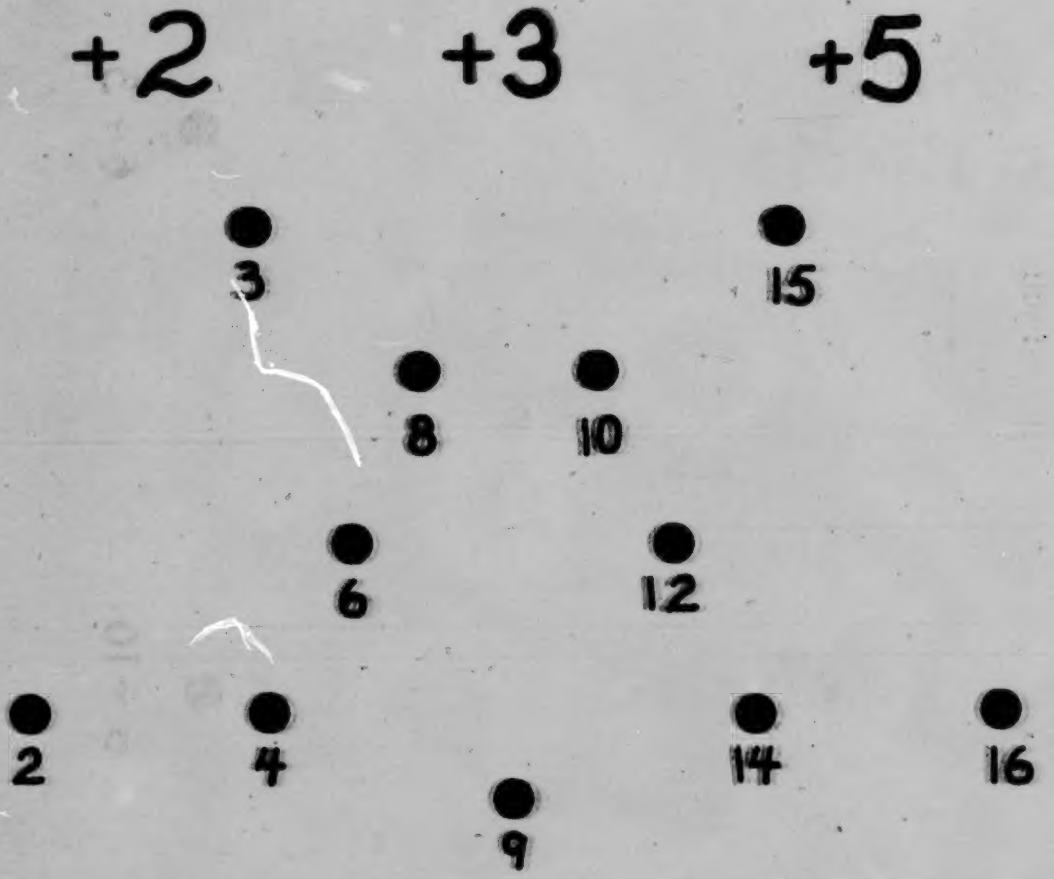
+1 +3

+2 +4



Name ______________________________

Draw all the missing arrows..

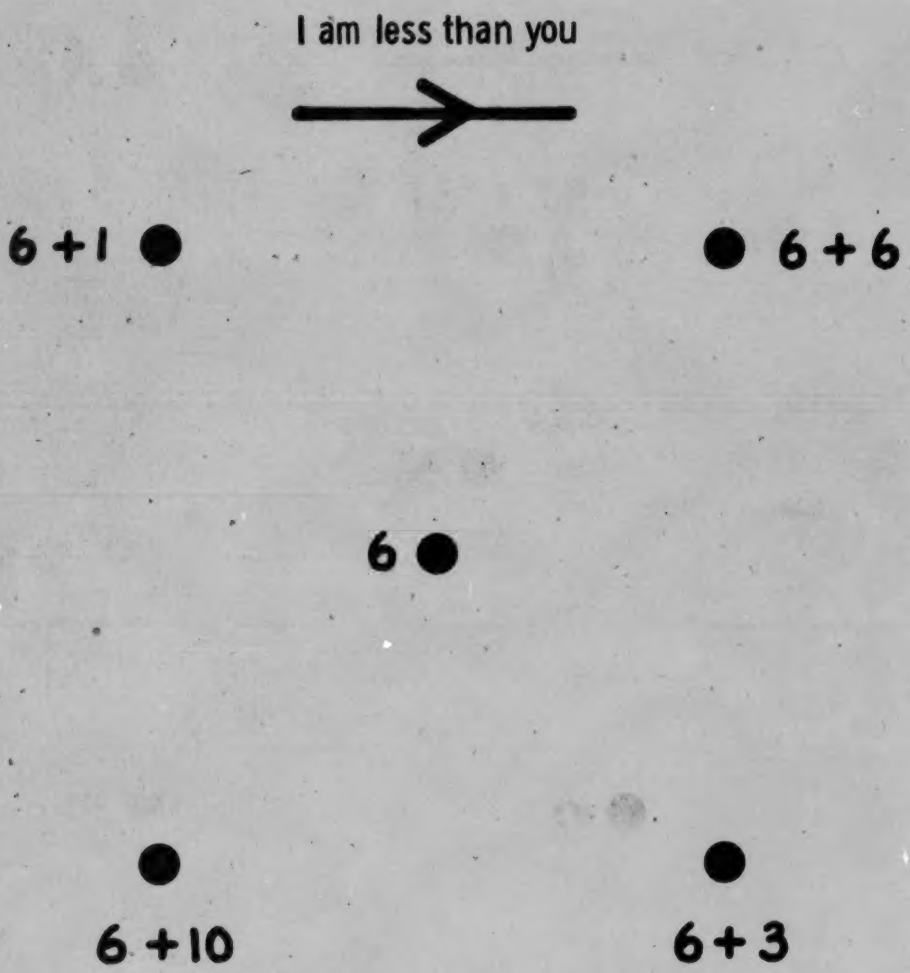


S 26.2 ****

Name ______________________

S 28.2 *

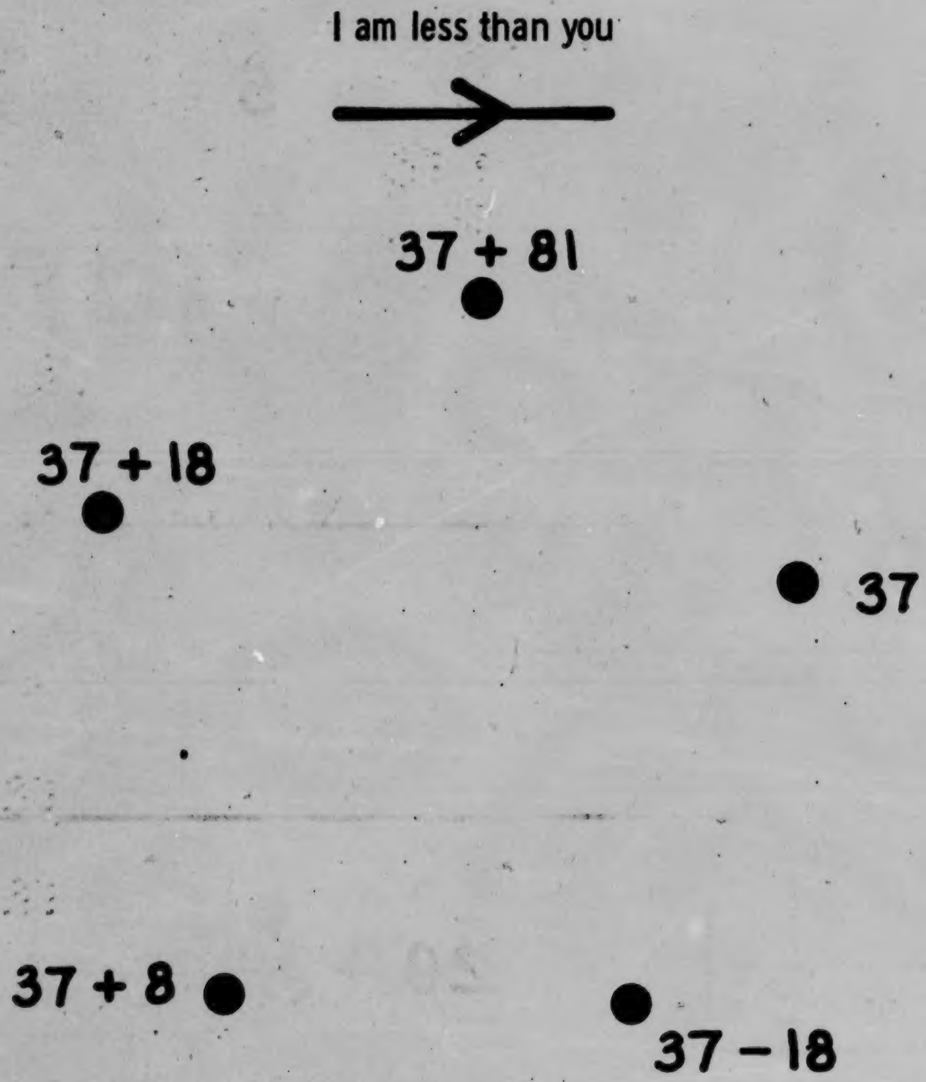
Draw all the missing red arrows.



Name ______________________________

S 28.2 **

Draw all the missing red arrows.

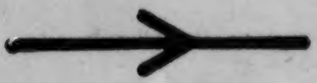


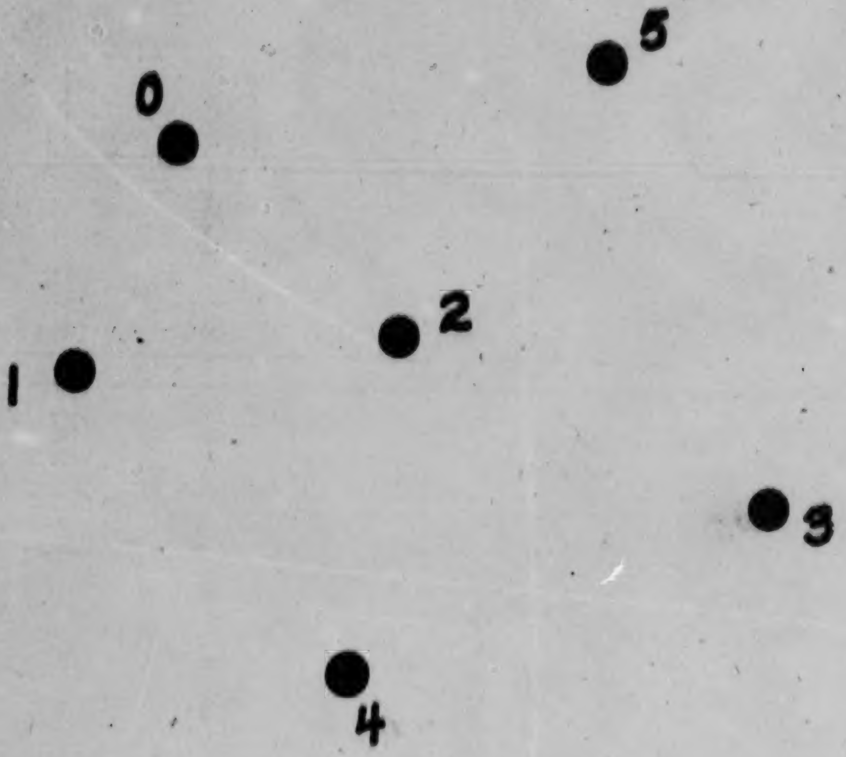
Name ____________________

S 29.2 *

Draw all the missing red arrows.

I am your 5-friend

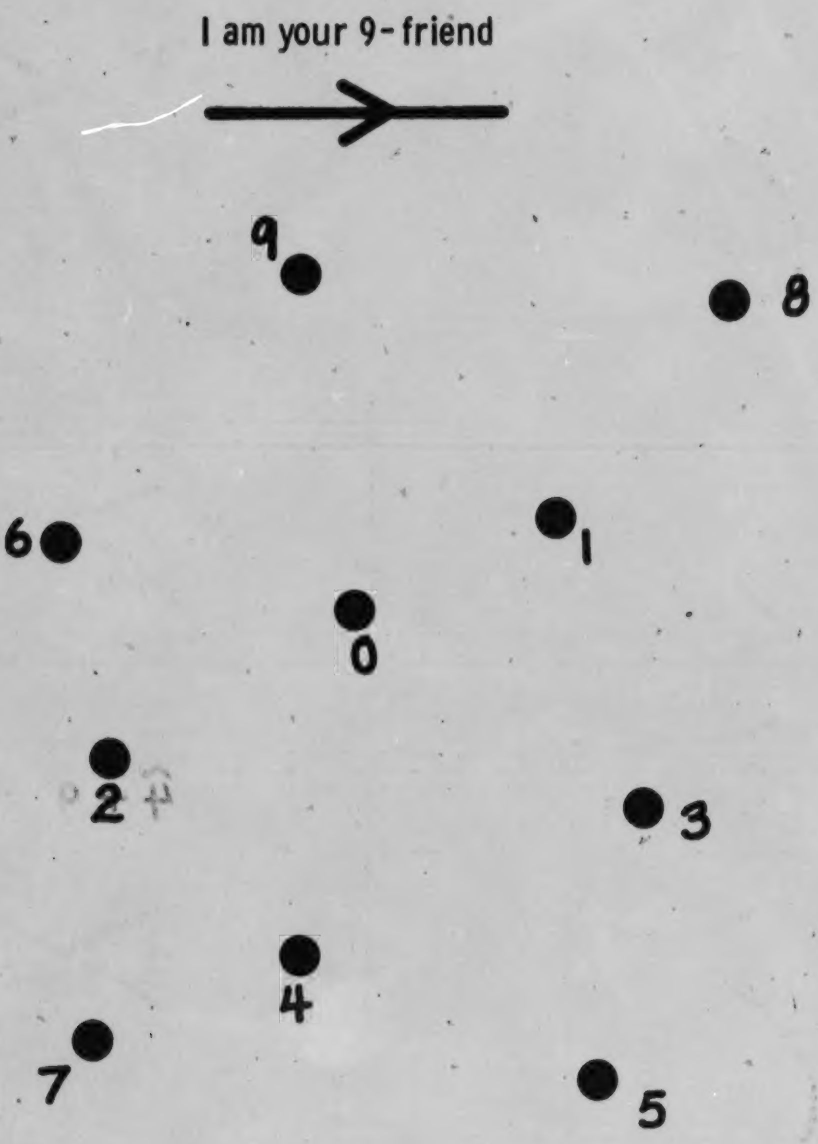




Name ______________________

S 29.2 **

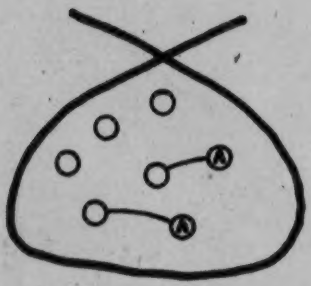
Draw all the missing blue arrows.



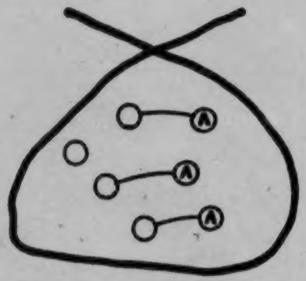
Name ______________________

S 34.2

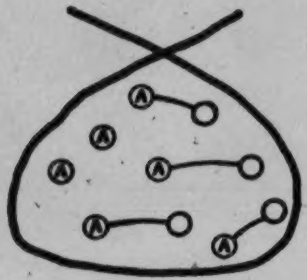
Complete the number stories.



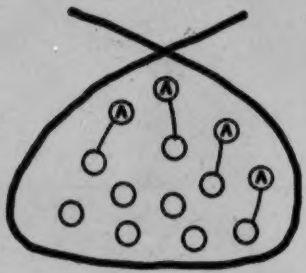
$5 + \hat{2} =$ ____



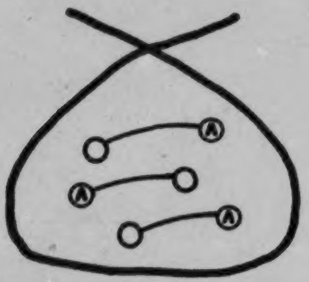
$4 + \hat{3} =$ ____



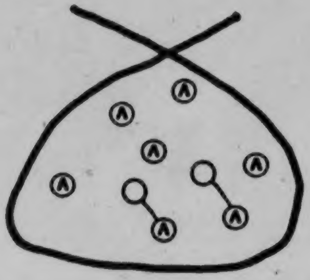
$\hat{6} + 4 =$ ____



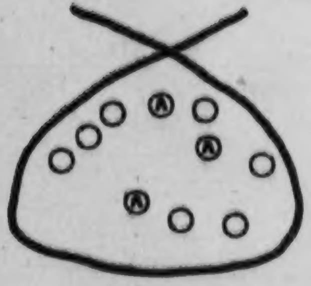
$\hat{4} + 9 =$ ____



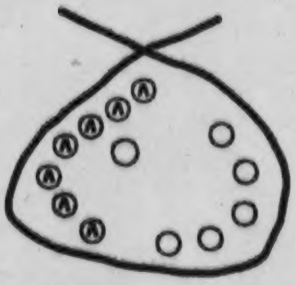
$3 + \hat{3} =$ ____



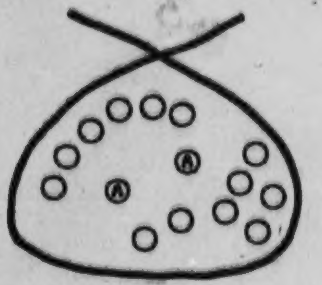
$2 + \hat{7} =$ ____



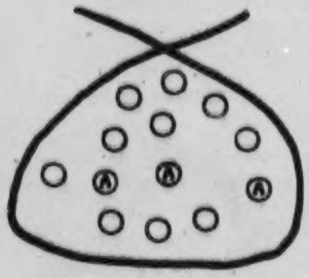
$7 + \hat{3} = \underline{\qquad}$



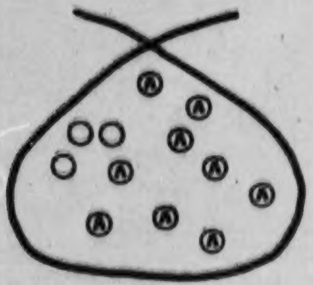
$\hat{7} + 6 = \underline{\qquad}$



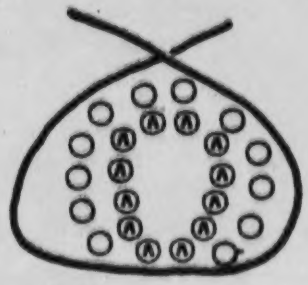
$13 + \widehat{2} = \underline{\qquad}$



$\hat{3} + 10 = \underline{\qquad}$



$3 + \hat{9} = \underline{\qquad}$



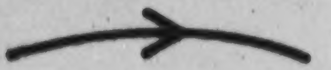
$\widehat{12} + 12 = \underline{\qquad}$

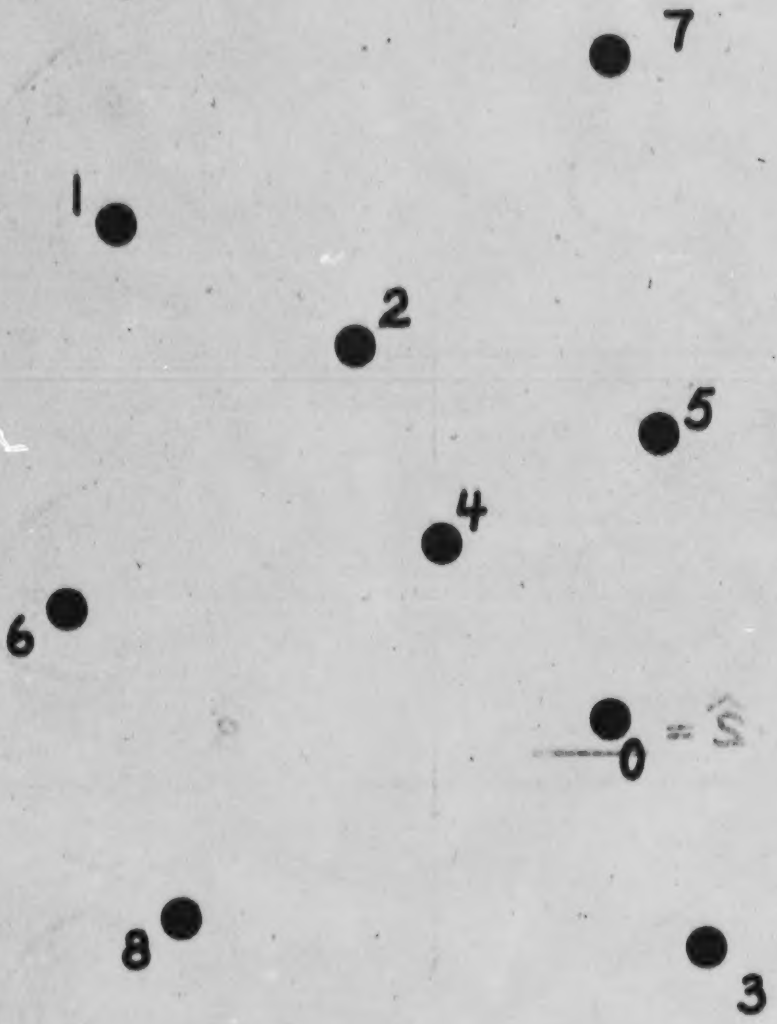
Name ______________________________

S 39.2 *

Draw all the missing red arrows.

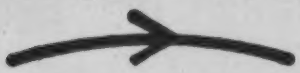
I am your 8-friend

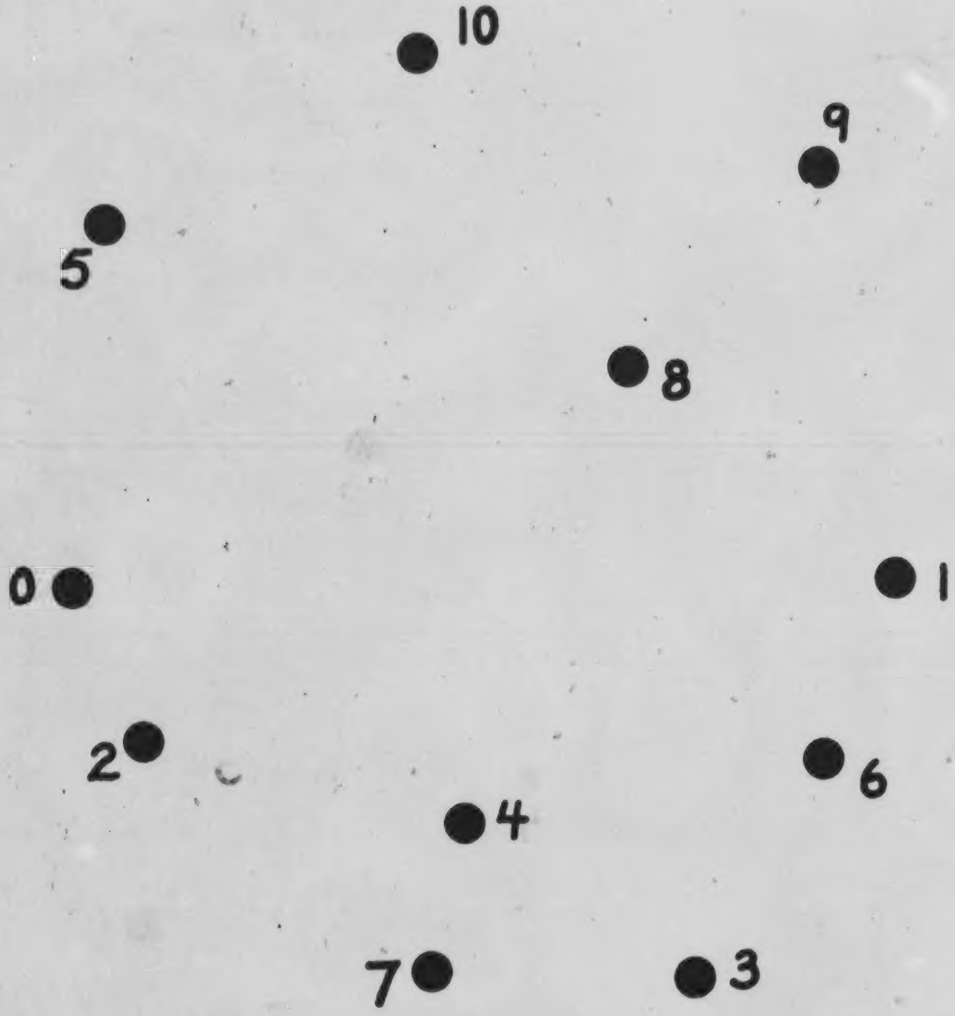




Draw all the missing blue arrows.

I am your 10-friend



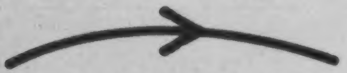


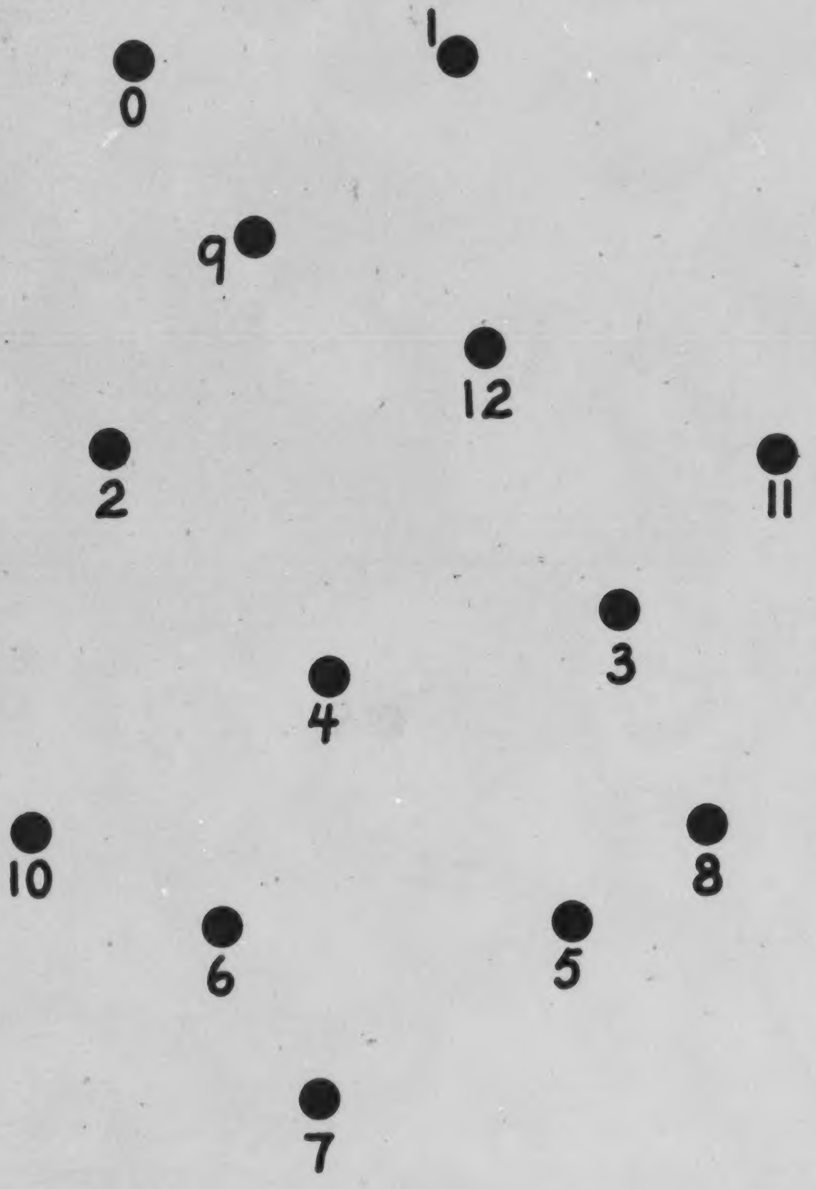
Name ______________________

S 39.2 **

Draw all the missing red arrows.

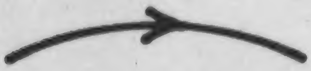
I am your 12-friend





Draw and label your own dots. Then draw all the missing blue arrows.

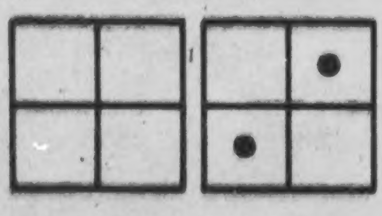
I am your 20-friend



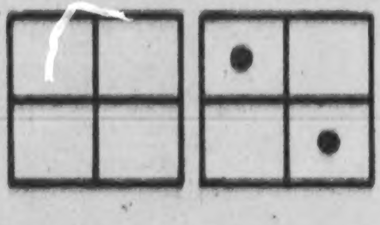
Name ______________________

S 42 *

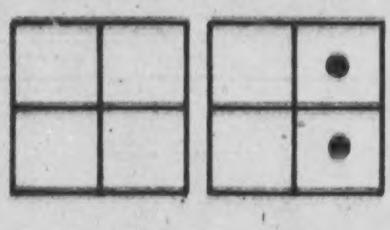
Complete the number stories.



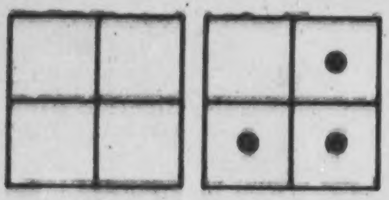
6 – 4 = ____



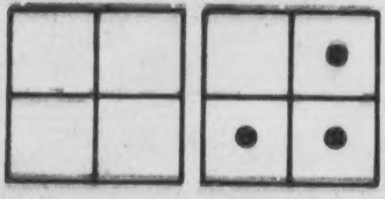
9 – 8 = ____



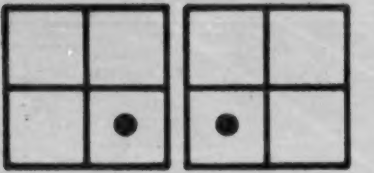
5 – 4 = ____



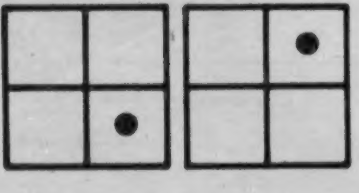
7 – 4 = ____



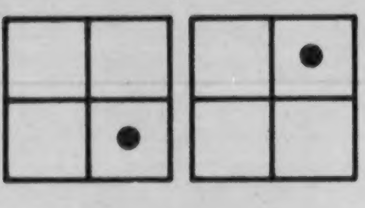
7 – 3 = ____



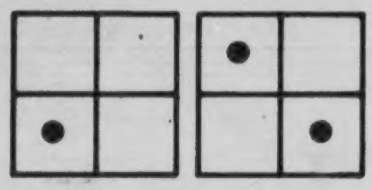
12 − 2 = ____



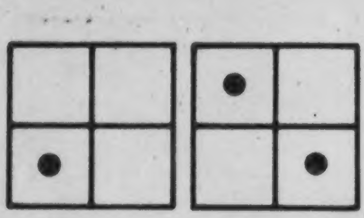
14 − 4 = ____



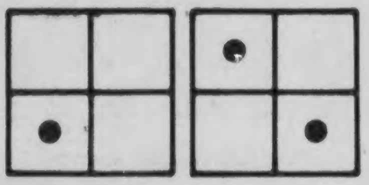
14 − 10 = ____



29 − 1 = ____



29 − 8 = ____

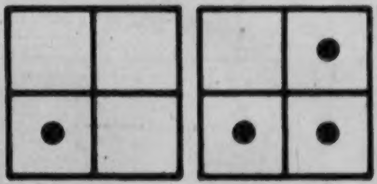


29 − 20 = ____

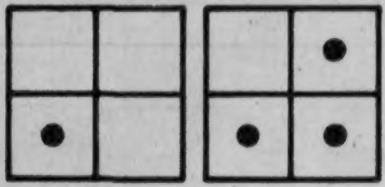
Name ______________________________

S 42 **

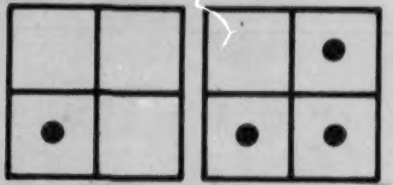
Complete the number stories.



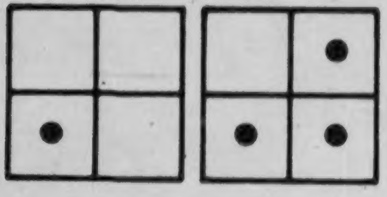
27 − 3 = ____



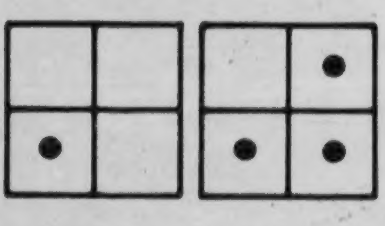
27 − 5 = ____



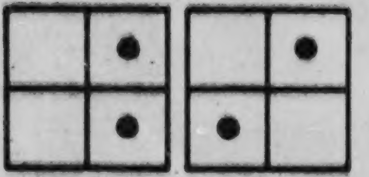
27 − 6 = ____



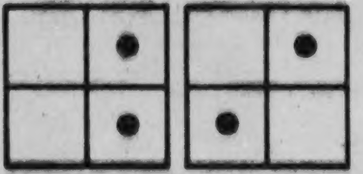
27 − 7 = ____



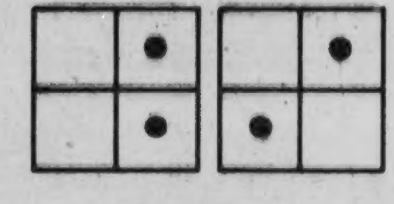
27 − 27 = ____



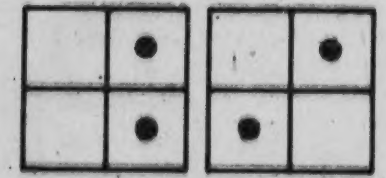
56 − 10 = ____



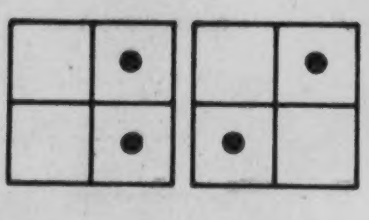
56 − 40 = ____



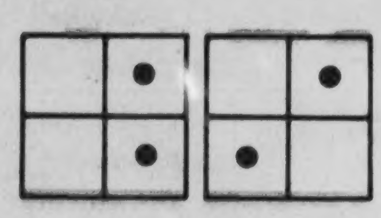
56 − 14 = ____



56 − 42 = ____



56 − 50 = ____

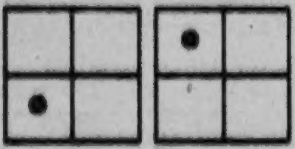


56 − 54 = ____

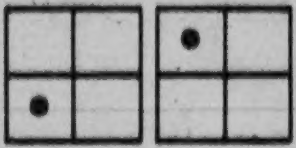
Name ______________________________

S 42 ***

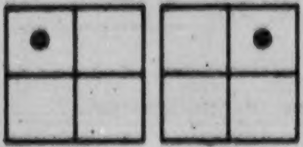
Complete the number stories.



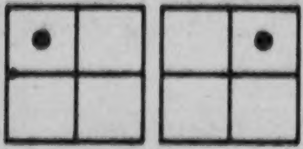
28 − 4 = ____



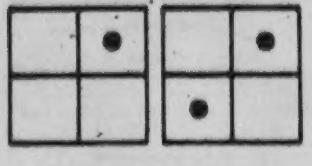
28 − 10 = ____



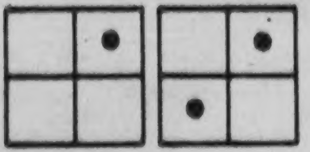
84 − 40 = ____



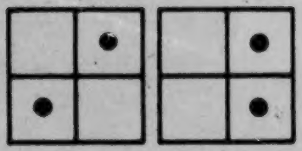
84 − 2 = ____



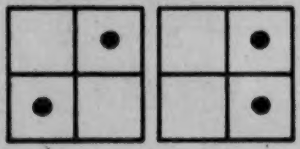
46 − 20 = ____



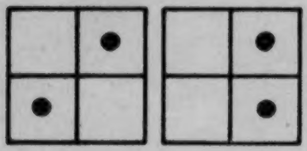
46 − 24 = ____



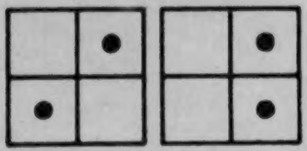
65 − 22 = ____



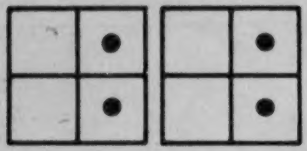
65 − 14 = ____



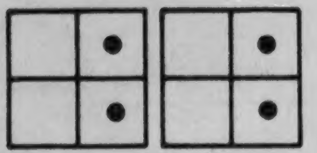
65 − 51 = ____



65 − 43 = ____



55 − 33 = ____

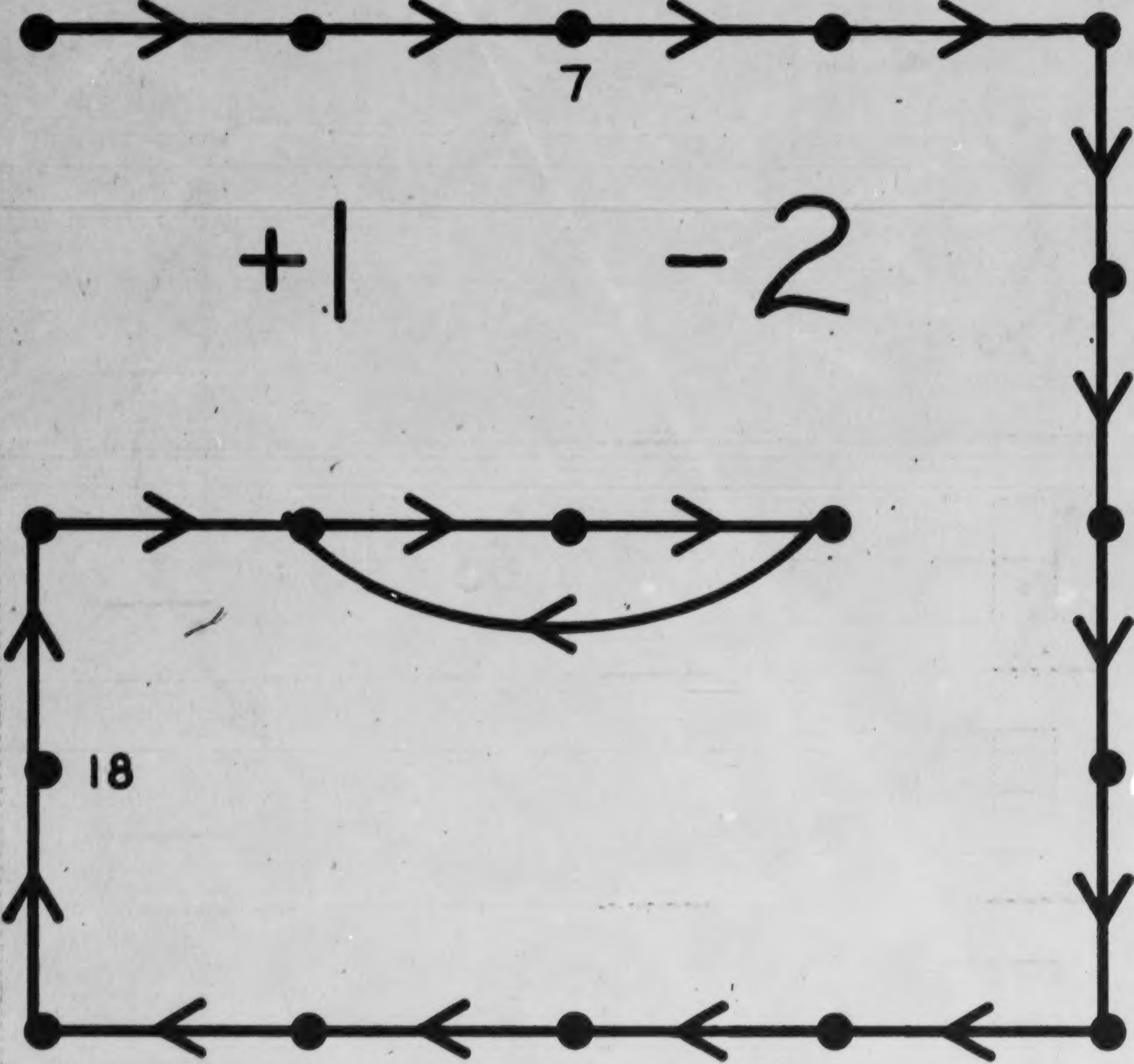


55 − 48 = ____

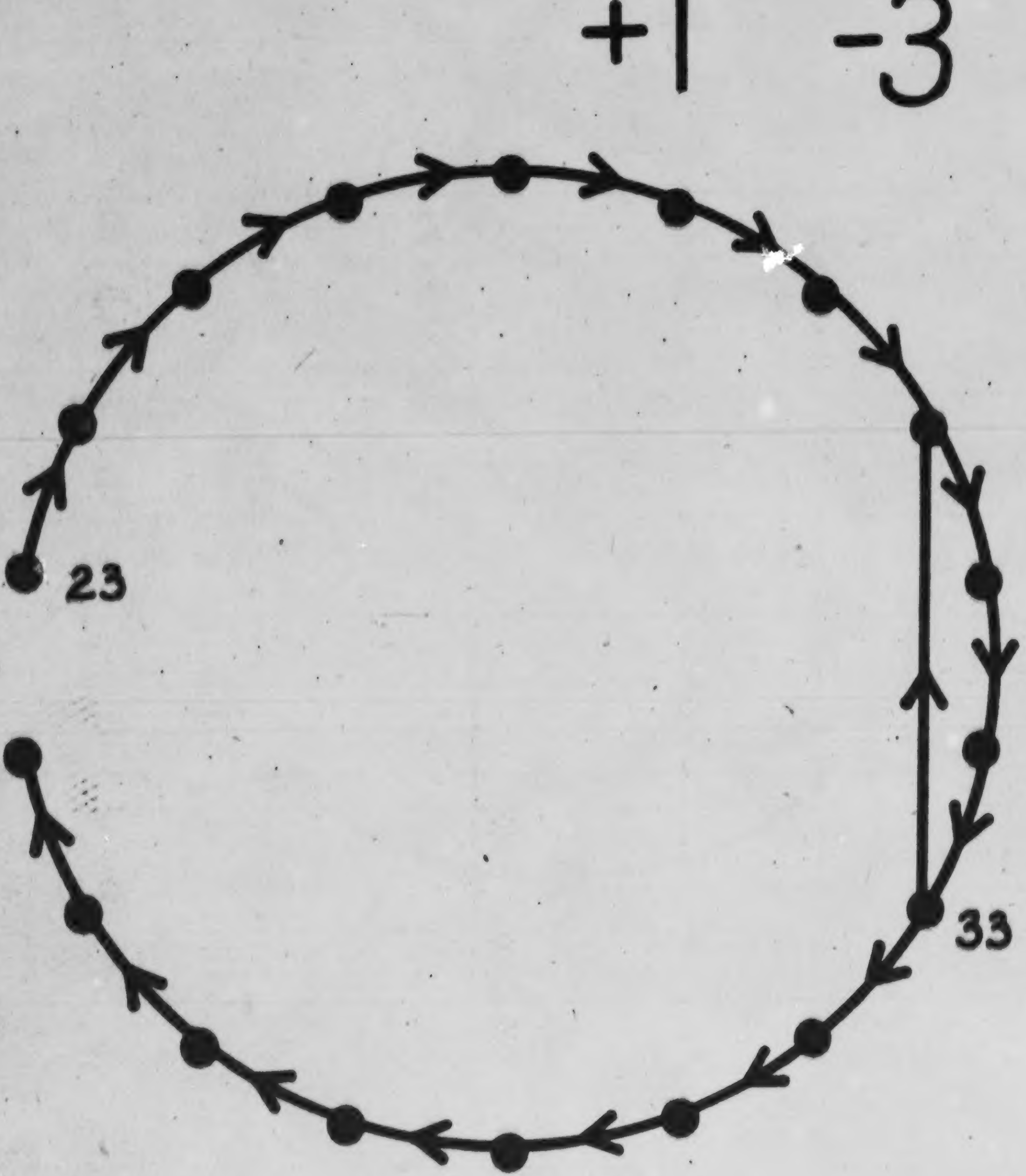
Name ______________________

S 44.2

Label the dots. Draw all the $^{-}2$ arrows.



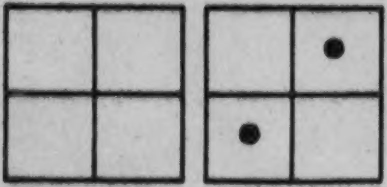
Label the dots. Draw all the -3 arrows.



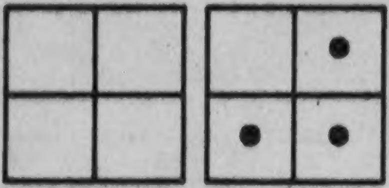
Name ______________________

S 45.2 *

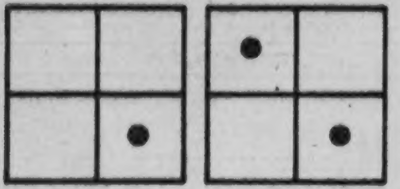
Complete the number stories.



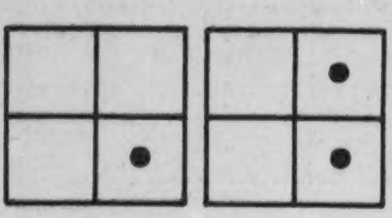
4 + 2 = ______



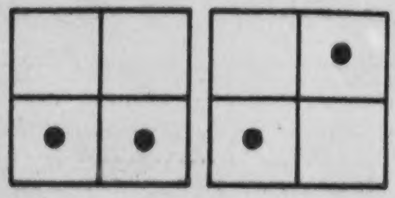
4 + 3 = ______



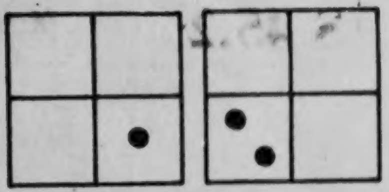
11 + 8 = ______



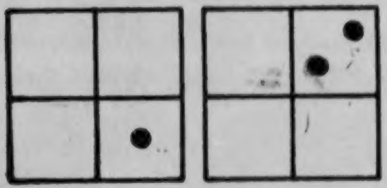
5 + 10 = ______



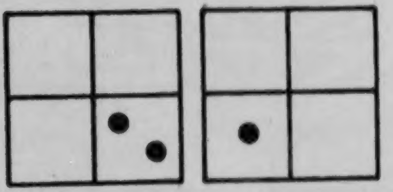
12 + 24 = ______



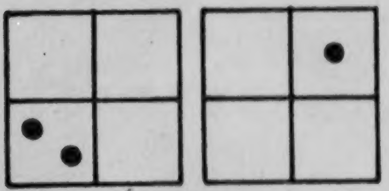
2 + 12 = ____



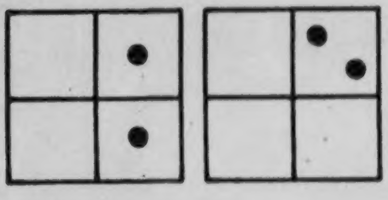
14 + 4 = ____



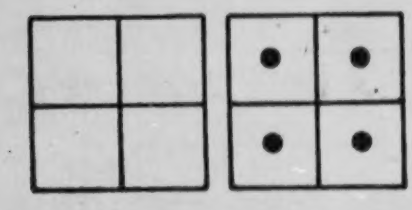
12 + 10 = ____



20 + 24 = ____



44 + 14 = ____



7 + 8 = ____

Name ______________________

S 45.2 **

Complete the number stories.

11 + 22 = ______

40 + 13 = ______

10 + 86 = ______

21 + 48 = ______

14 + 31 = ______

24 + 32 = ____

56 + 40 = ____

12 + 13 = ____

15 + 14 = ____

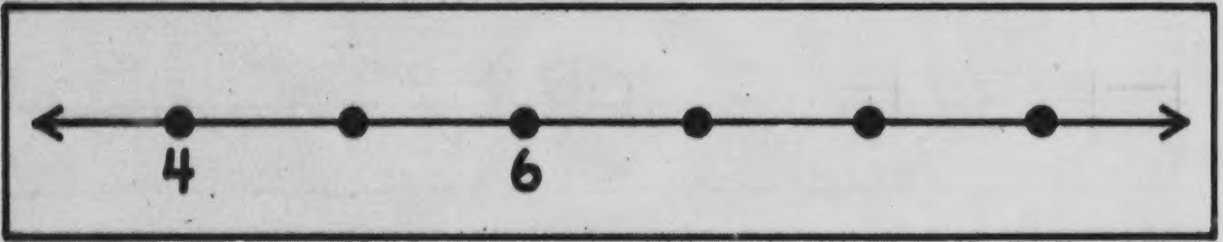
42 + 28 = ____

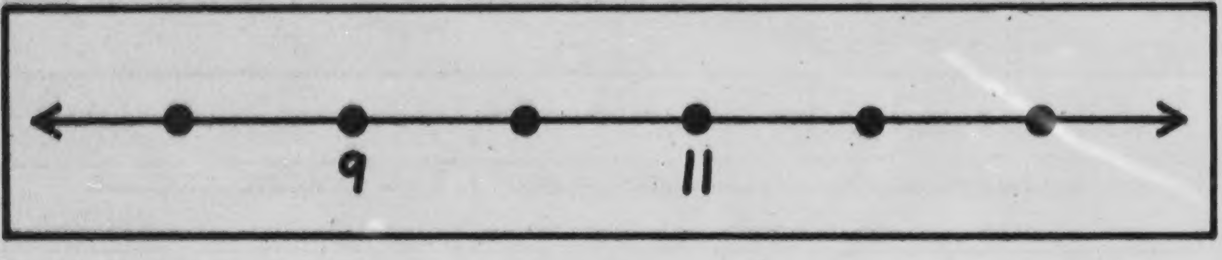
28 + 23 = ____

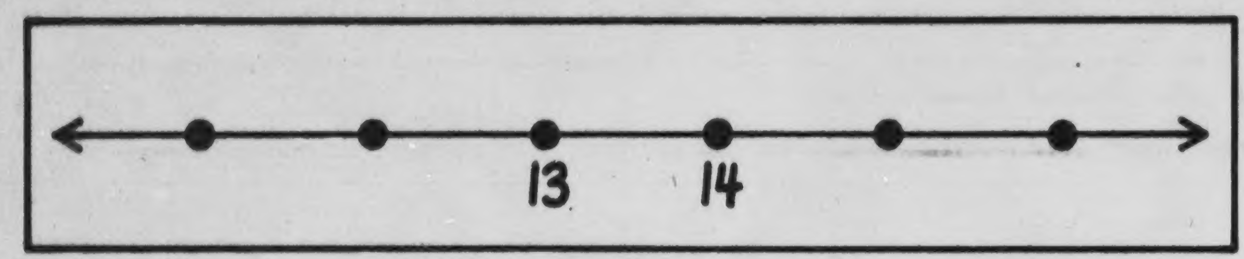
Name ______________________

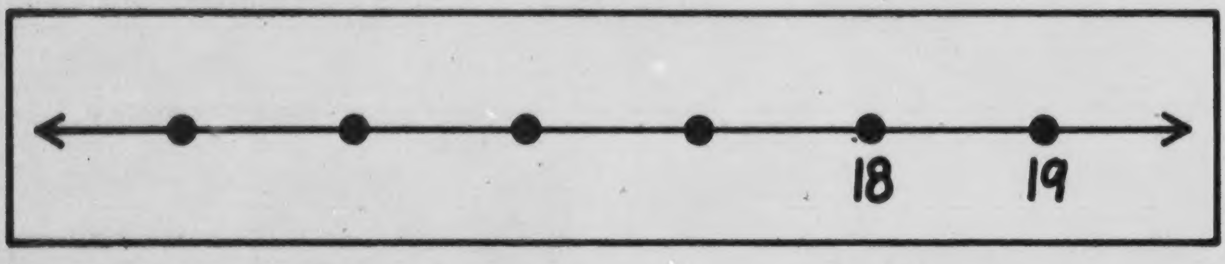
S 48.2 *

Label the dots on these number lines.

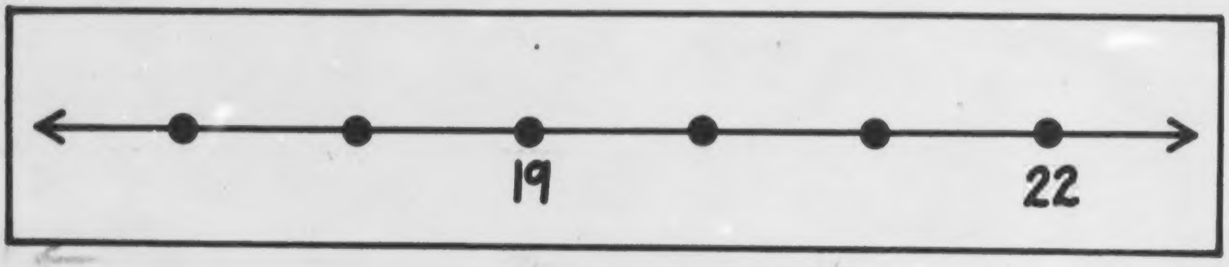


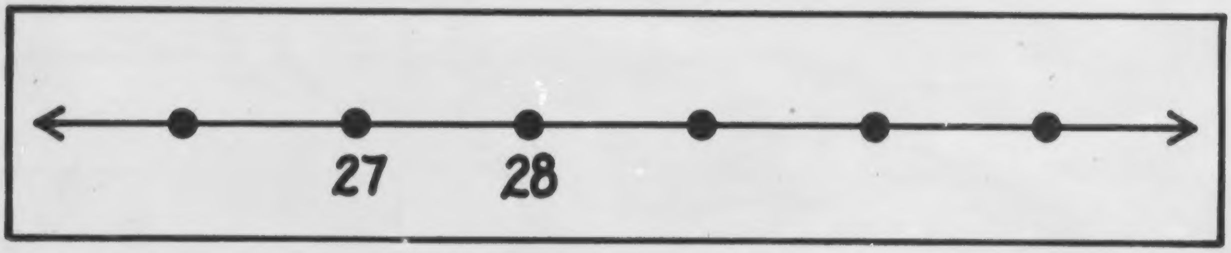


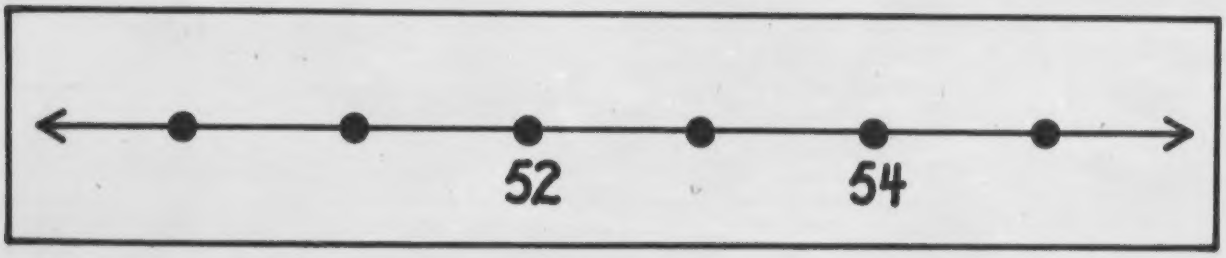


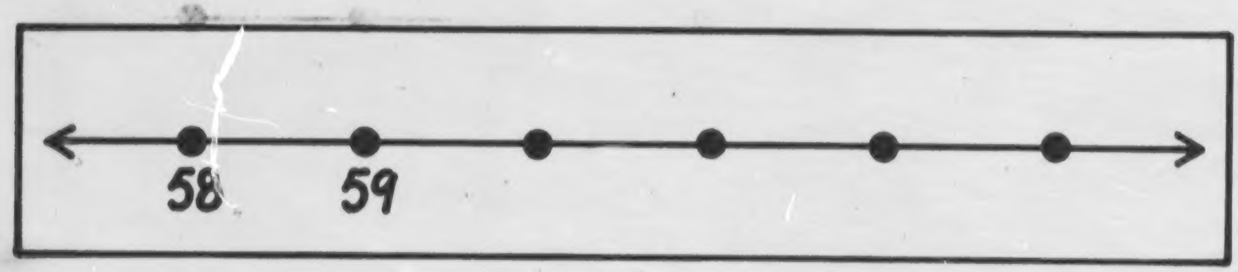


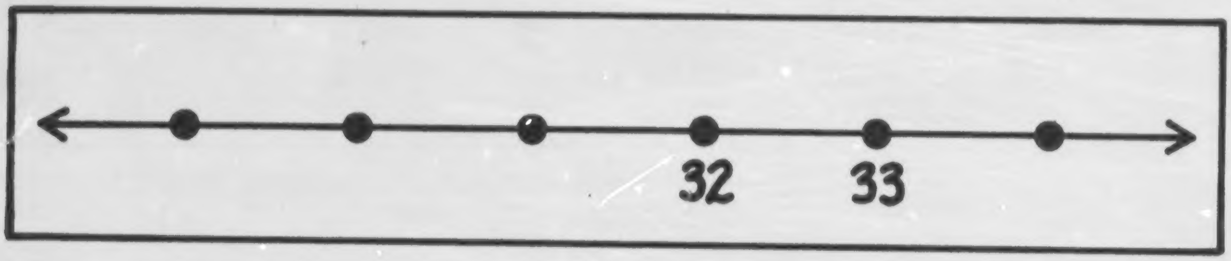
Label the dots on these number lines.







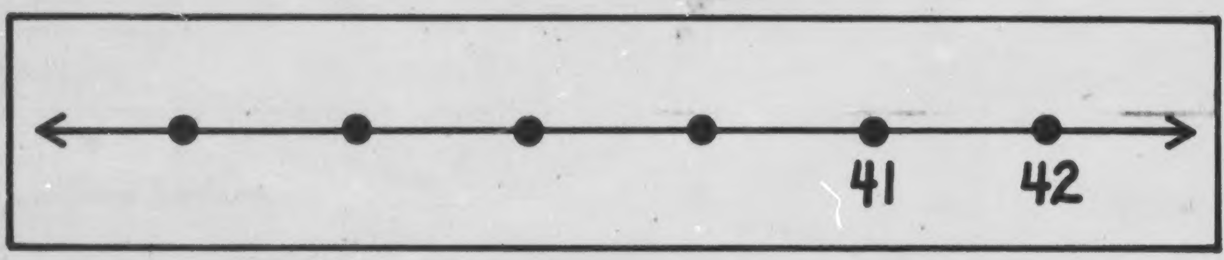


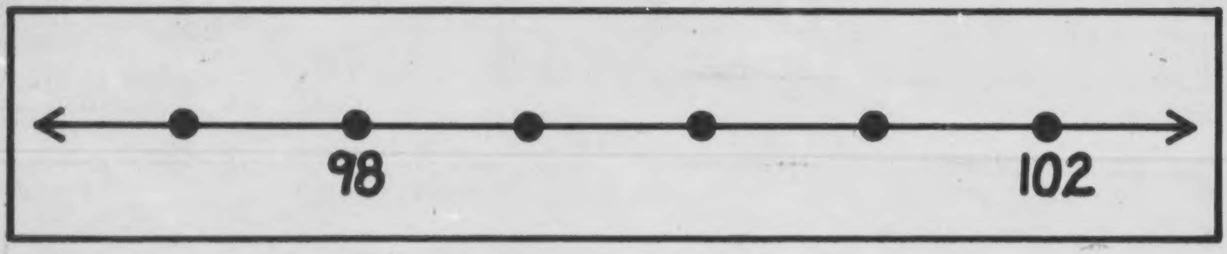


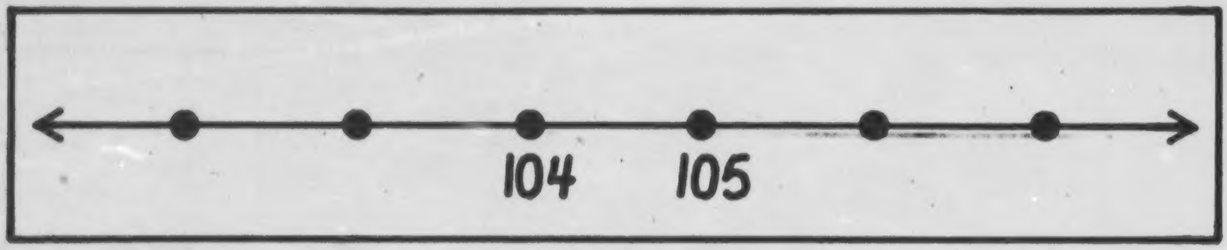
Name ____________________

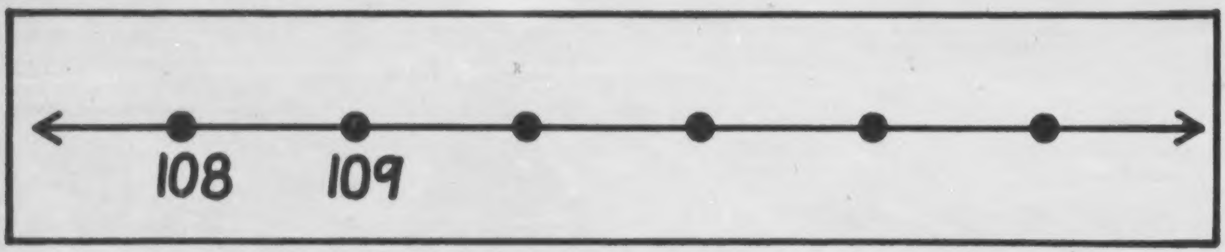
S 48.2 **

Label the dots on these number lines.

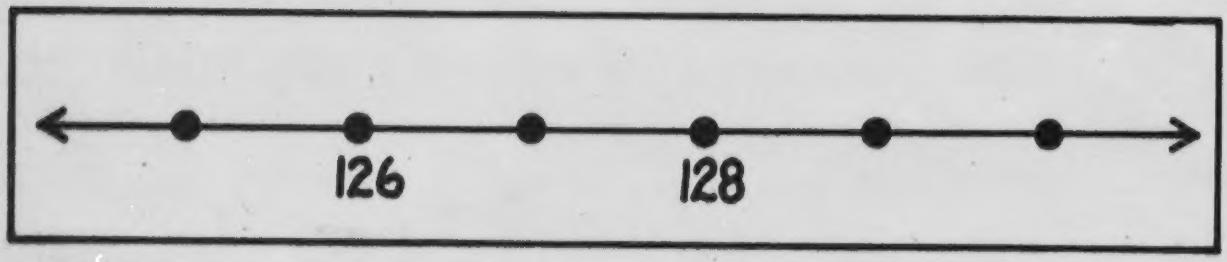


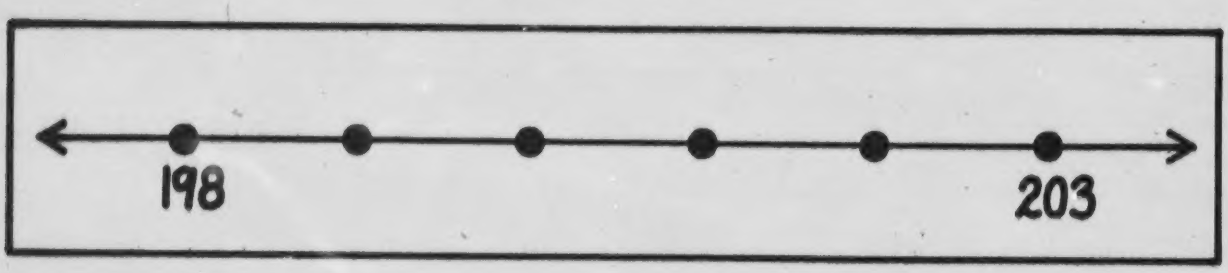


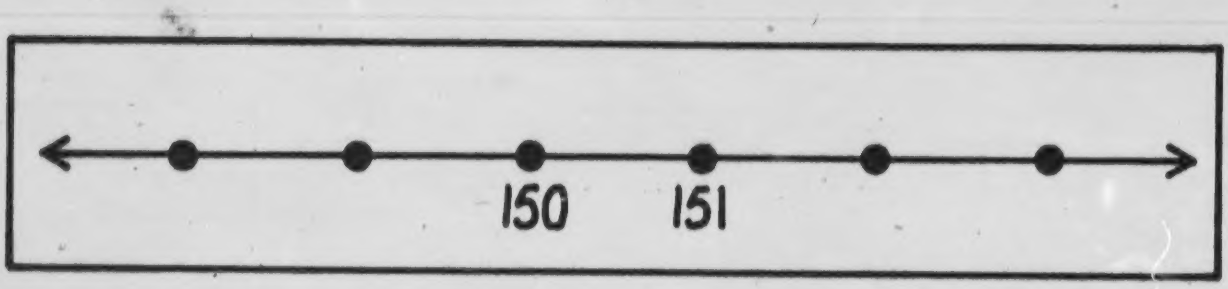


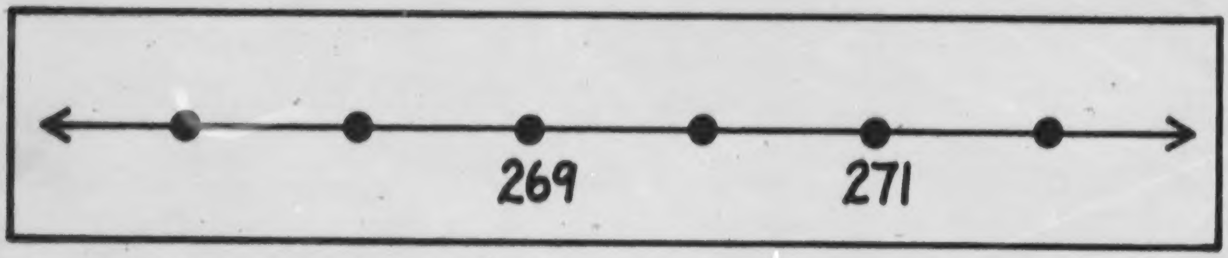


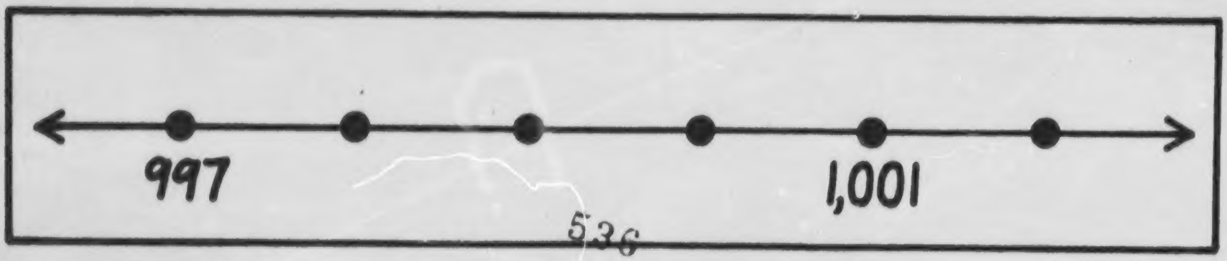
Label the dots on these number lines.







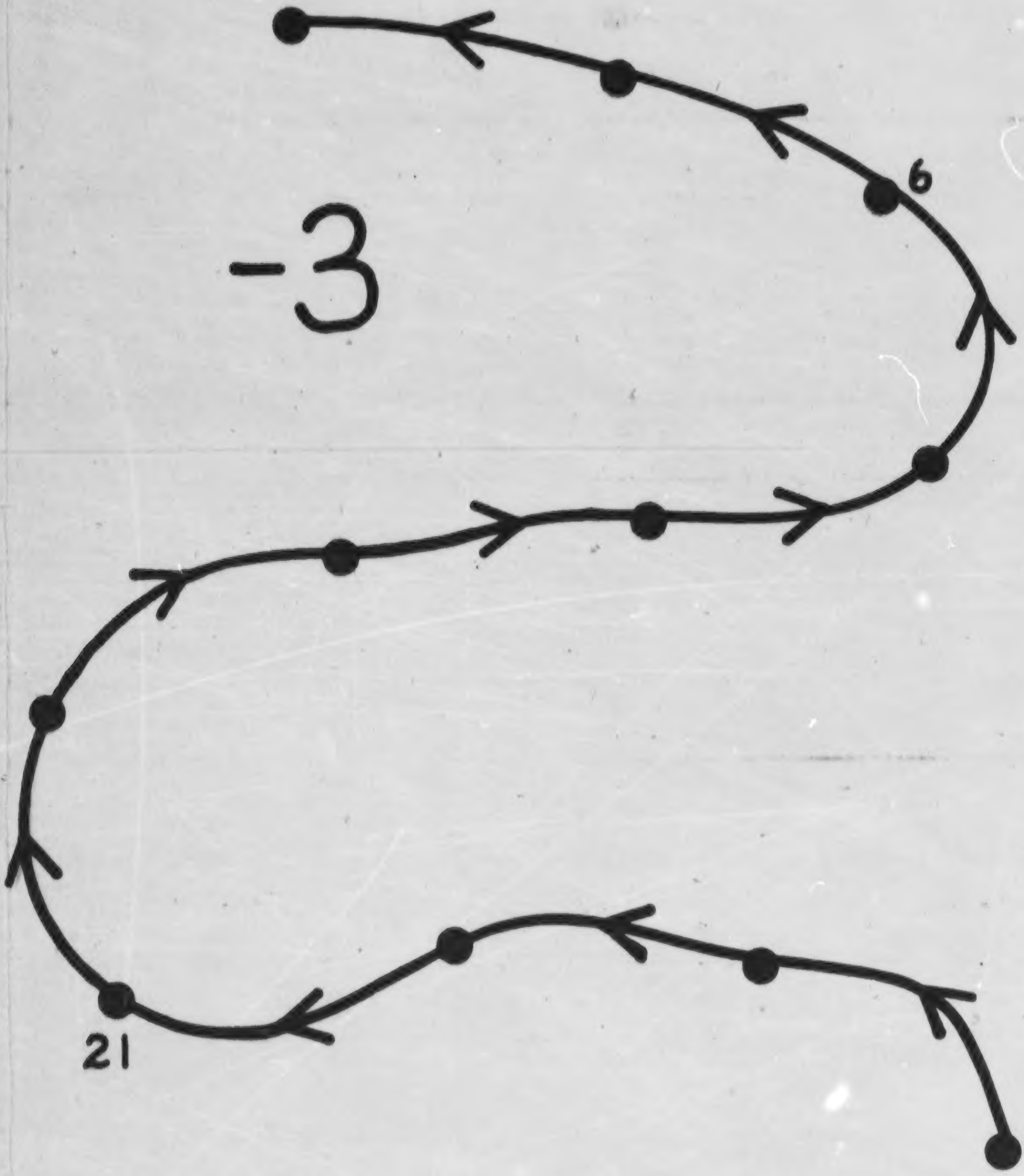




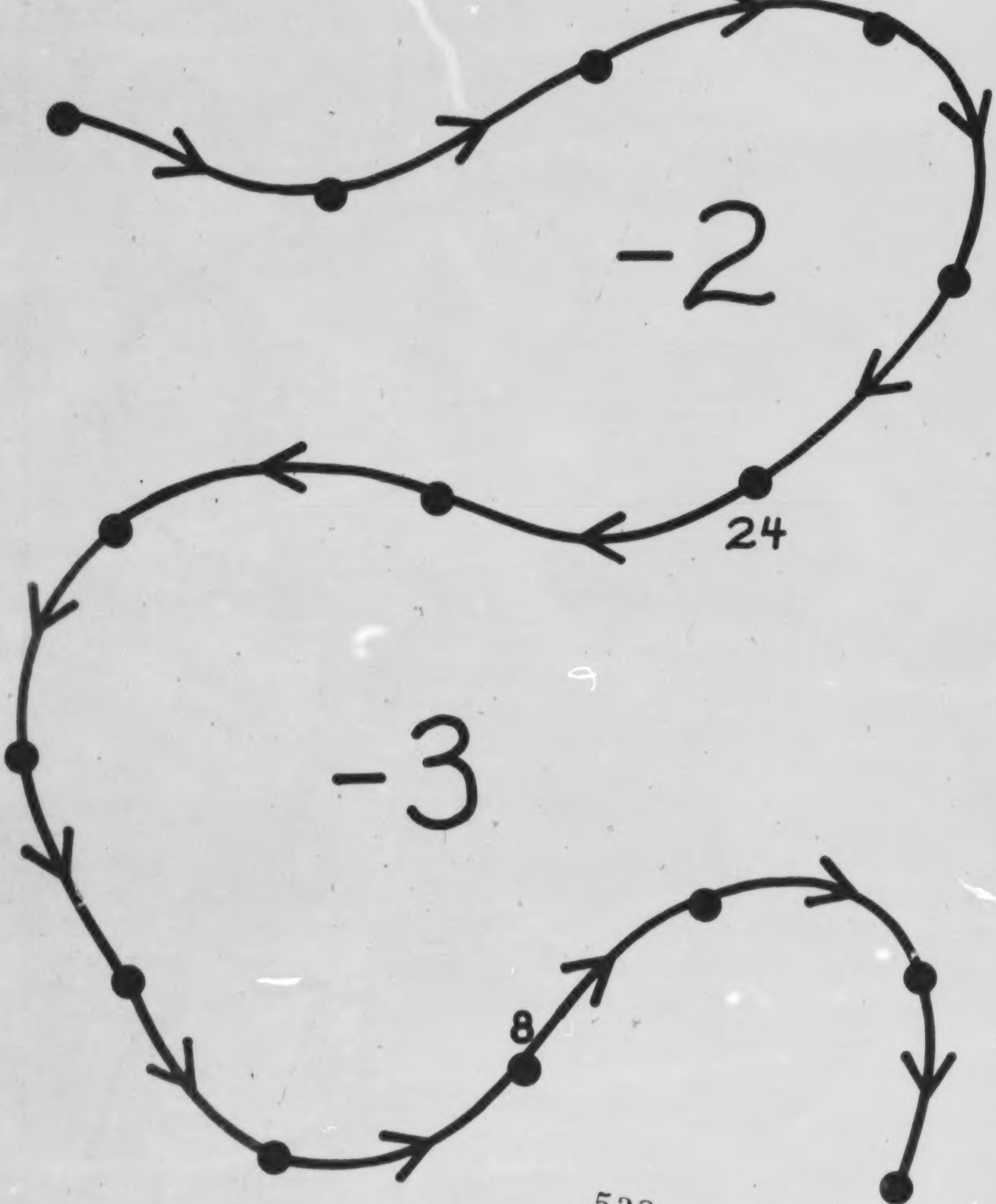
Name ____________________

S 52.2

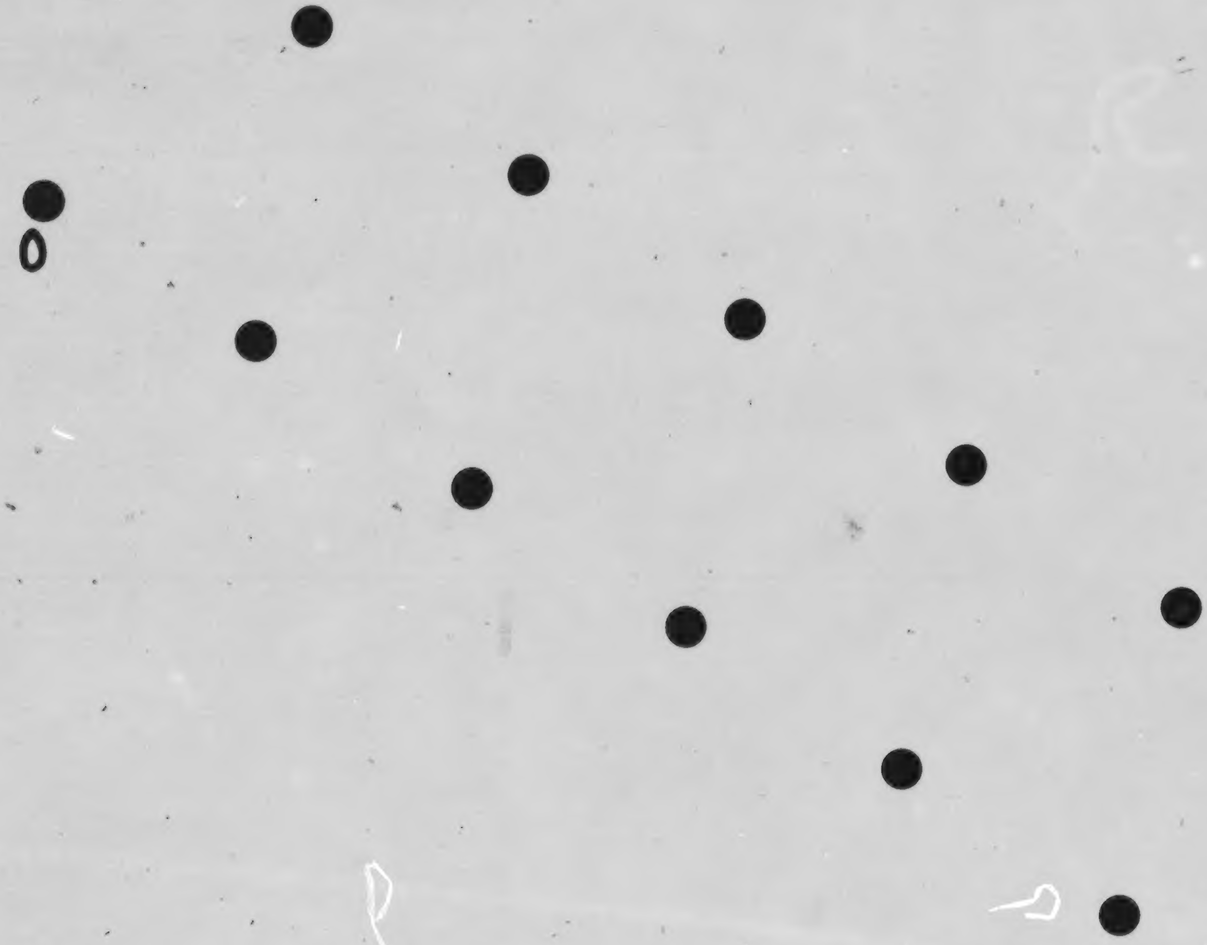
Label the dots.



Label the dots.



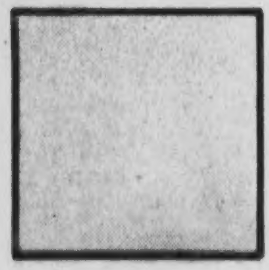
Name ____________________

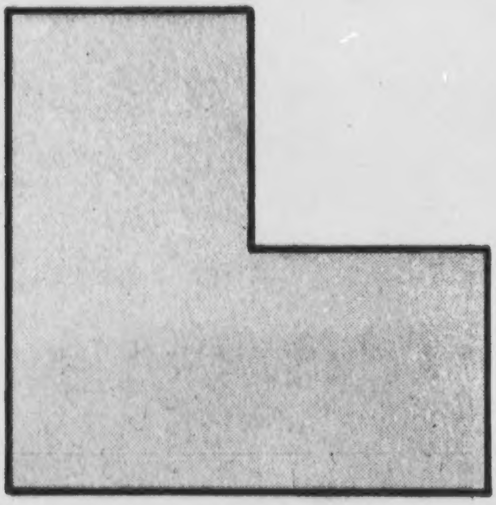


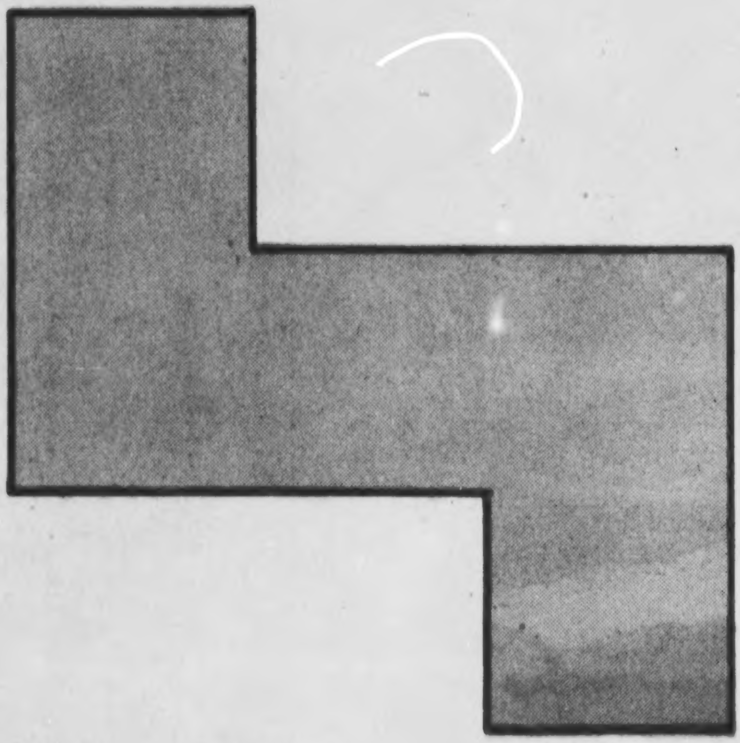
S 56

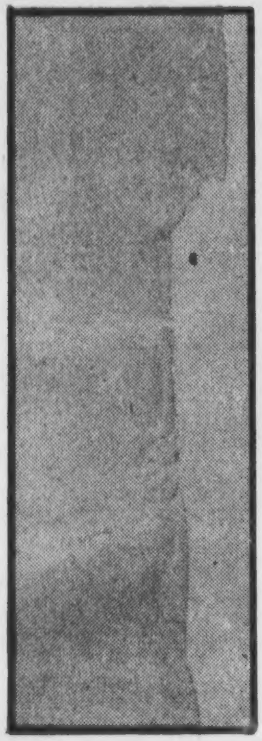
Name ______________________________ **S 57.2 ***

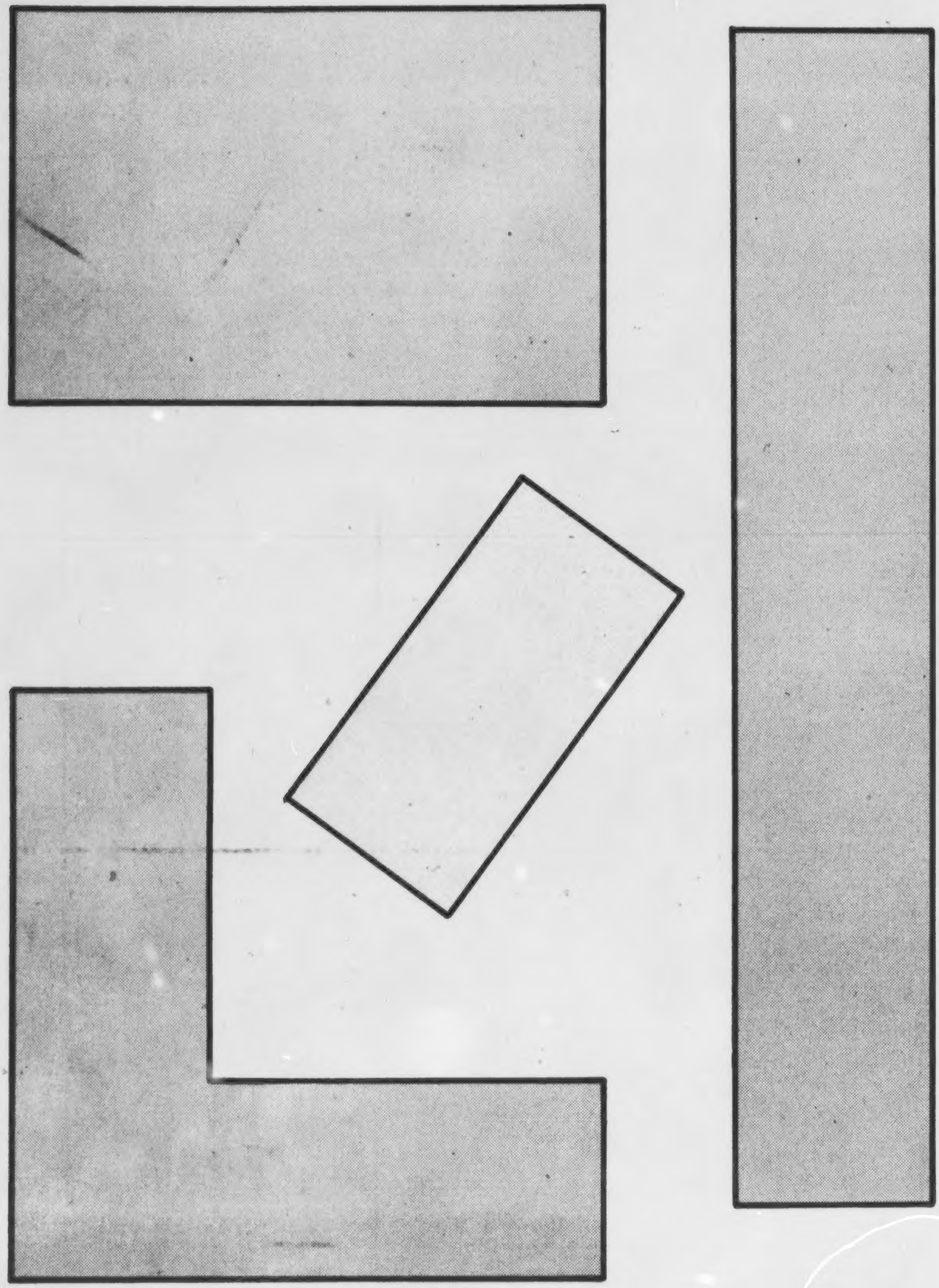
Find the area of each shape.







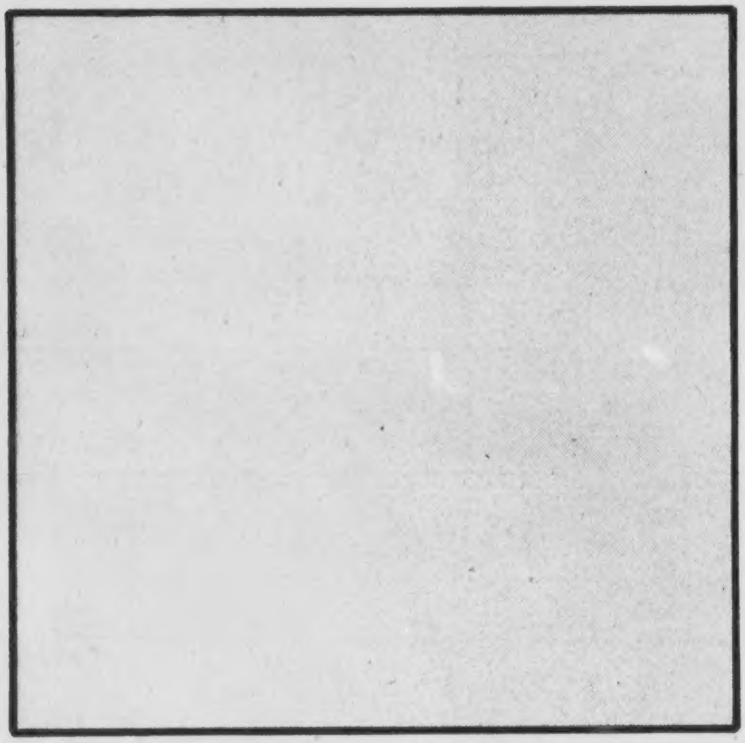


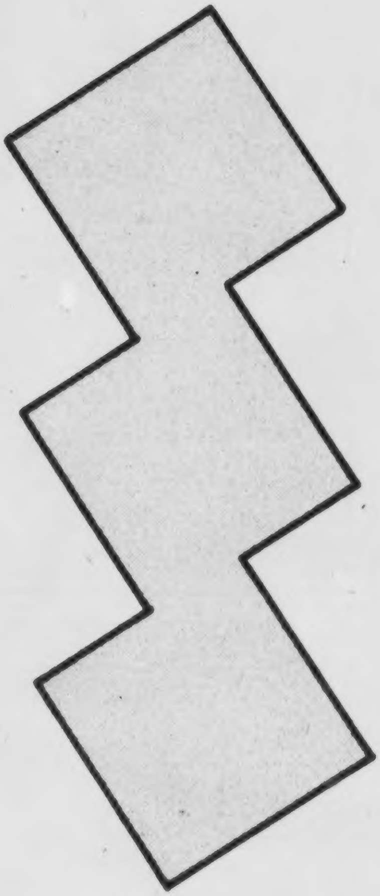


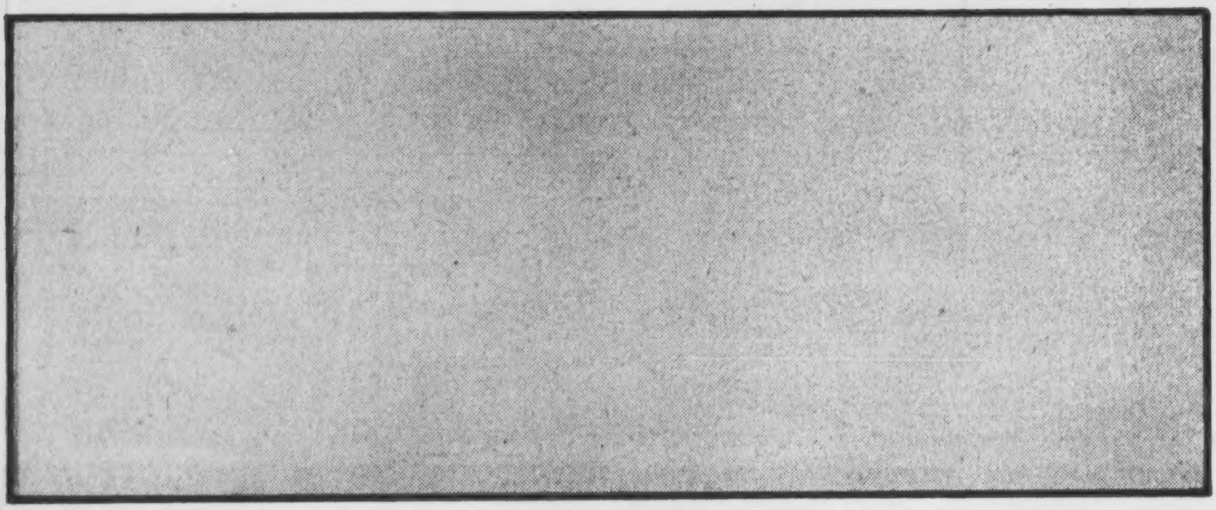
Name ______________________________

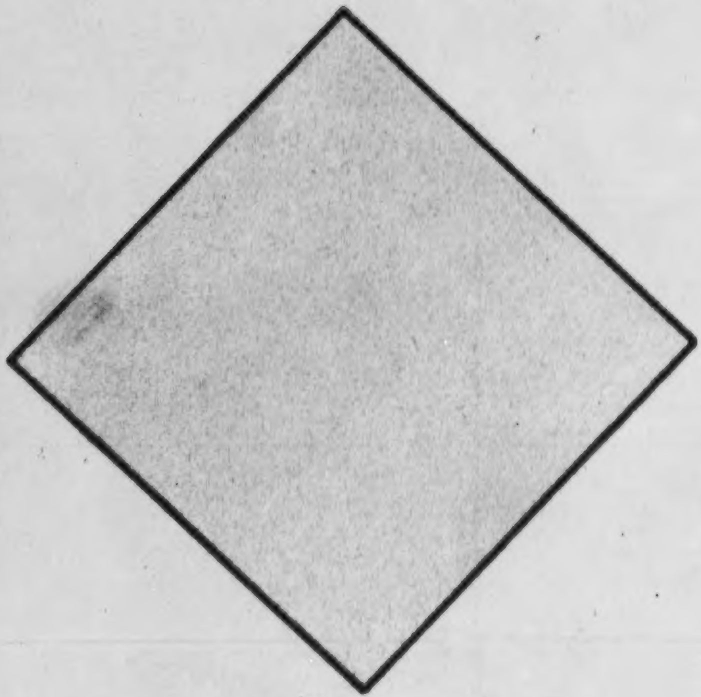
S 57.2 **

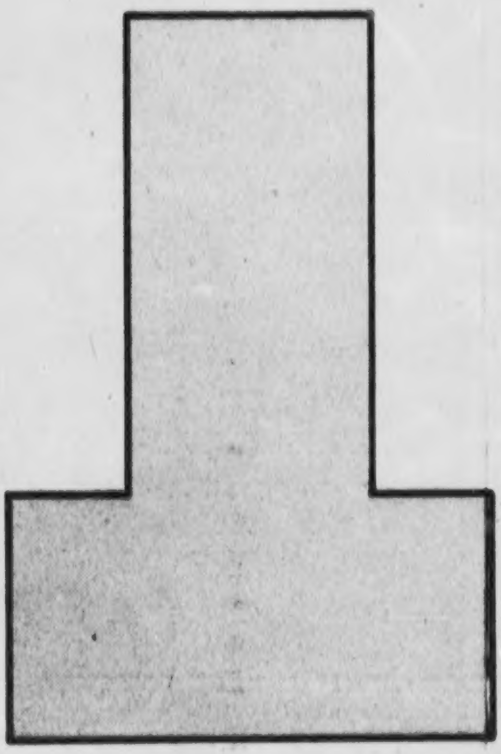
Find the area of each shape.

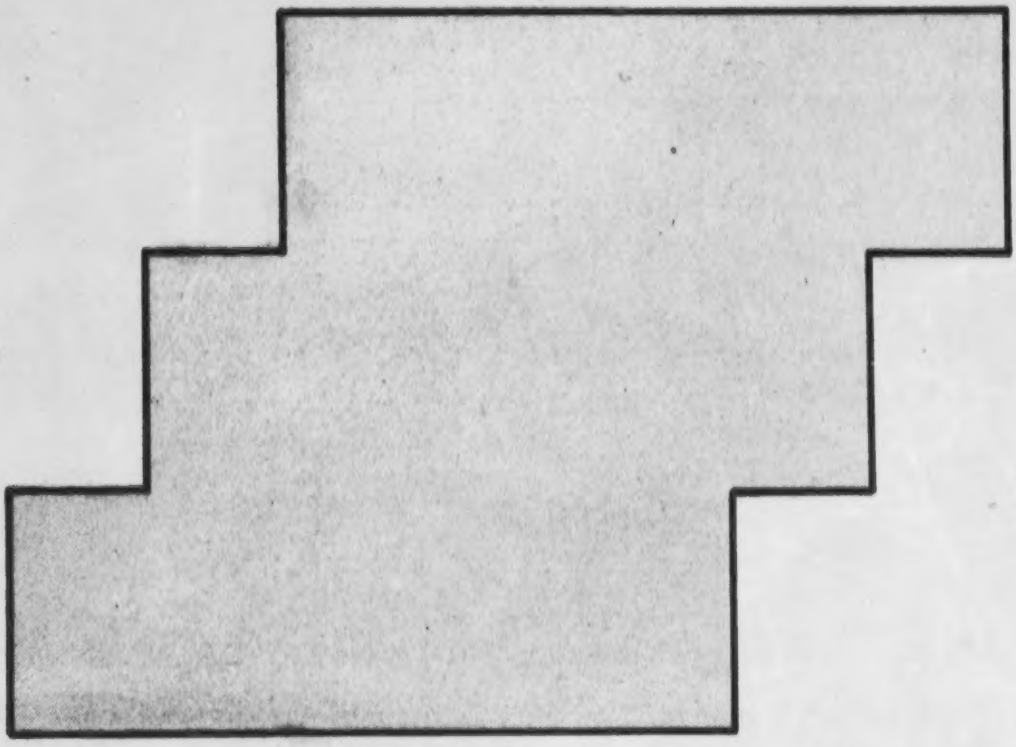










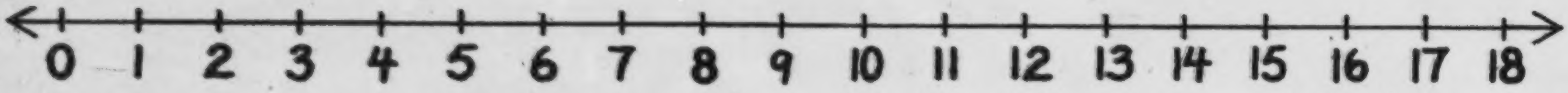


Name ______________________

S 59 *

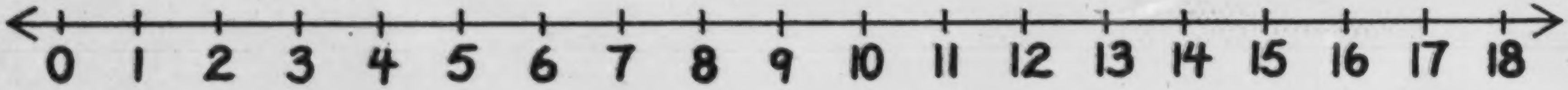
Start at 1 and draw +2 arrows.

+2



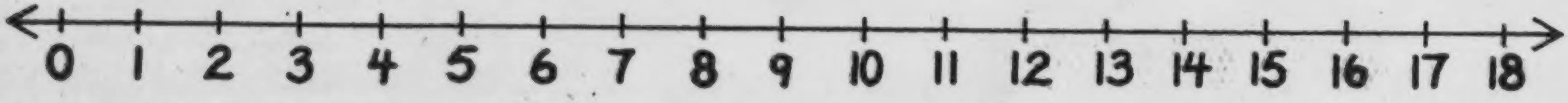
Start at 2 and draw +3 arrows.

+3



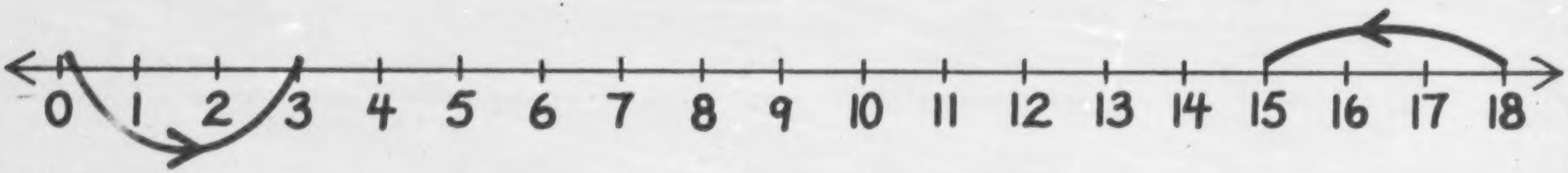
Start at 1 and draw +5 arrows.

+5



Start at 0 and draw $^{+3}$ arrows.

Start at 18 and draw $^{-3}$ arrows.



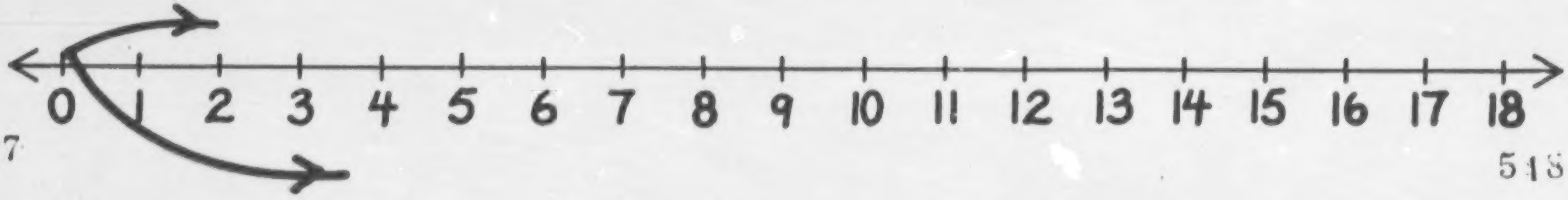
+3

-3

+6

Start at 0 and draw $^{+6}$ arrows.

Start at 0 and draw $^{+3}$ arrows.

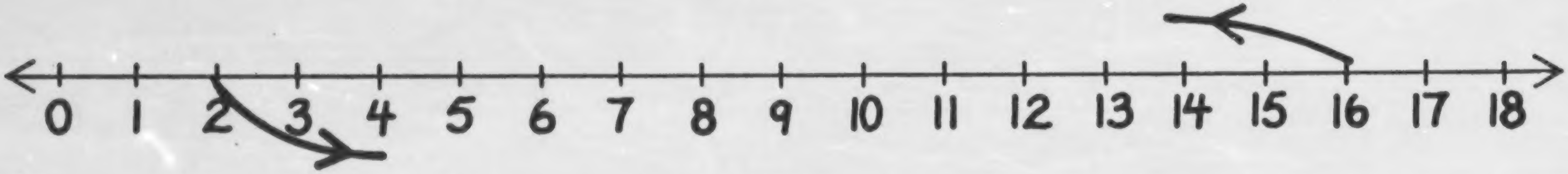


Name ________________________________

S 59 **

Start at 2 and draw + 4 arrows.

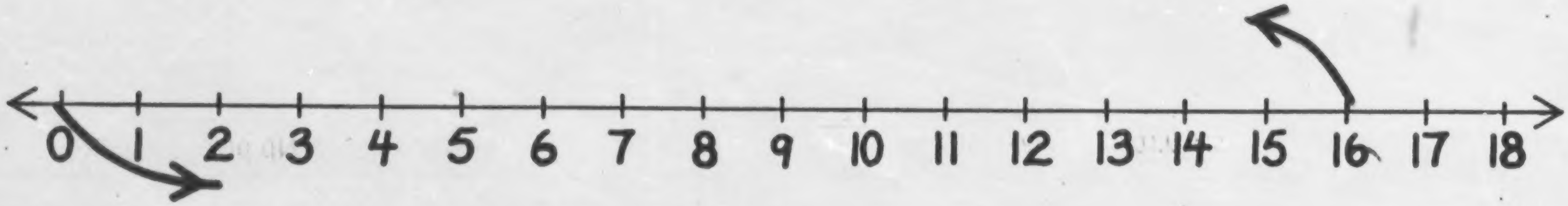
Start at 16 and draw $^-4$ arrows.



+4 -4 -8

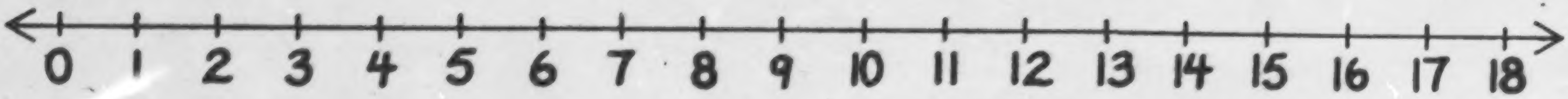
Start at 0 and draw + 4 arrows.

Start at 16 and draw $^-8$ arrows.



Start at 0 and draw +9 arrows.

Start at 18 and draw −6 arrows.



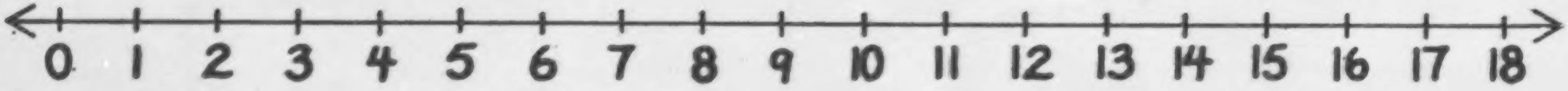
+9

−6

+4

Start at 17 and draw −6 arrows.

Start at 1 and draw +4 arrows.

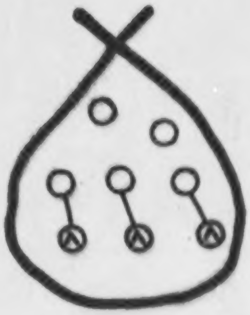


Name ______________________

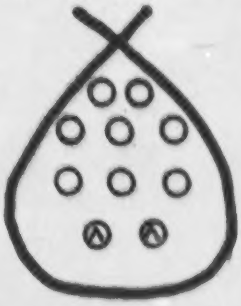
S 61.2 *

Complete.

$$5+\hat{3}=\square$$



$$8+\hat{2}=\square$$



$$7+\hat{4}=\square$$

$$\hat{5}+6=\square$$

$\hat{3} + 3 = \square$

$3 + \hat{6} = \square$

$\hat{4} + 9 = \square$

$2 + \hat{7} = \square$

Name ____________________ **S 61.2 ****

Complete.

$$6 + 4 = \square$$

$$\hat{3} + \hat{2} = \square$$

$$14 + \widehat{11} = \square$$

$$\widehat{23} + 20 = \square$$

$$10 + \square = 7$$

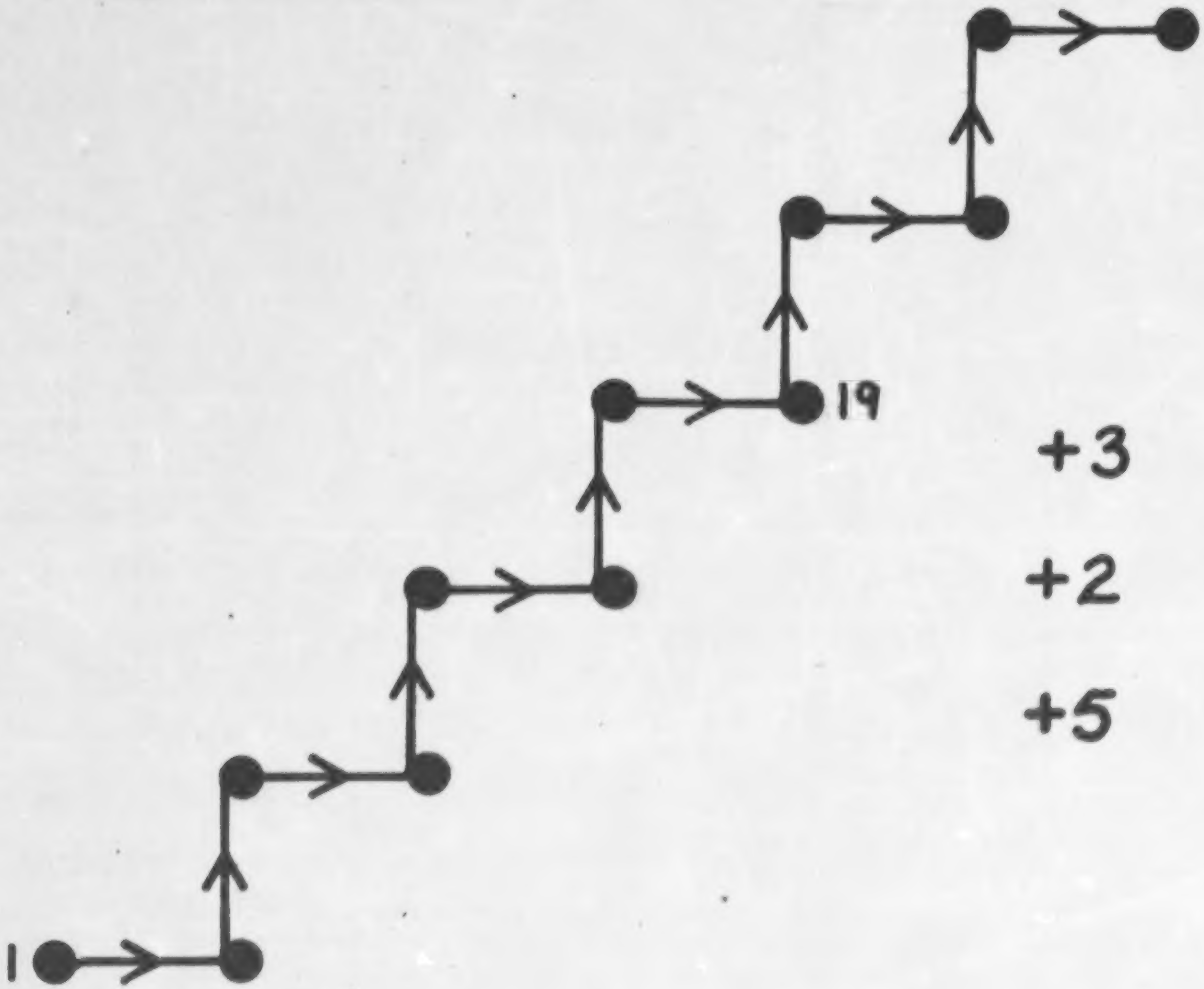
$$\hat{3} + \square = 5$$

$$106 + \square = 100$$

$$\widehat{50} + \square = \widehat{62}$$

Name ______________________

Label the dots. Draw all the **+5** arrows.



+3

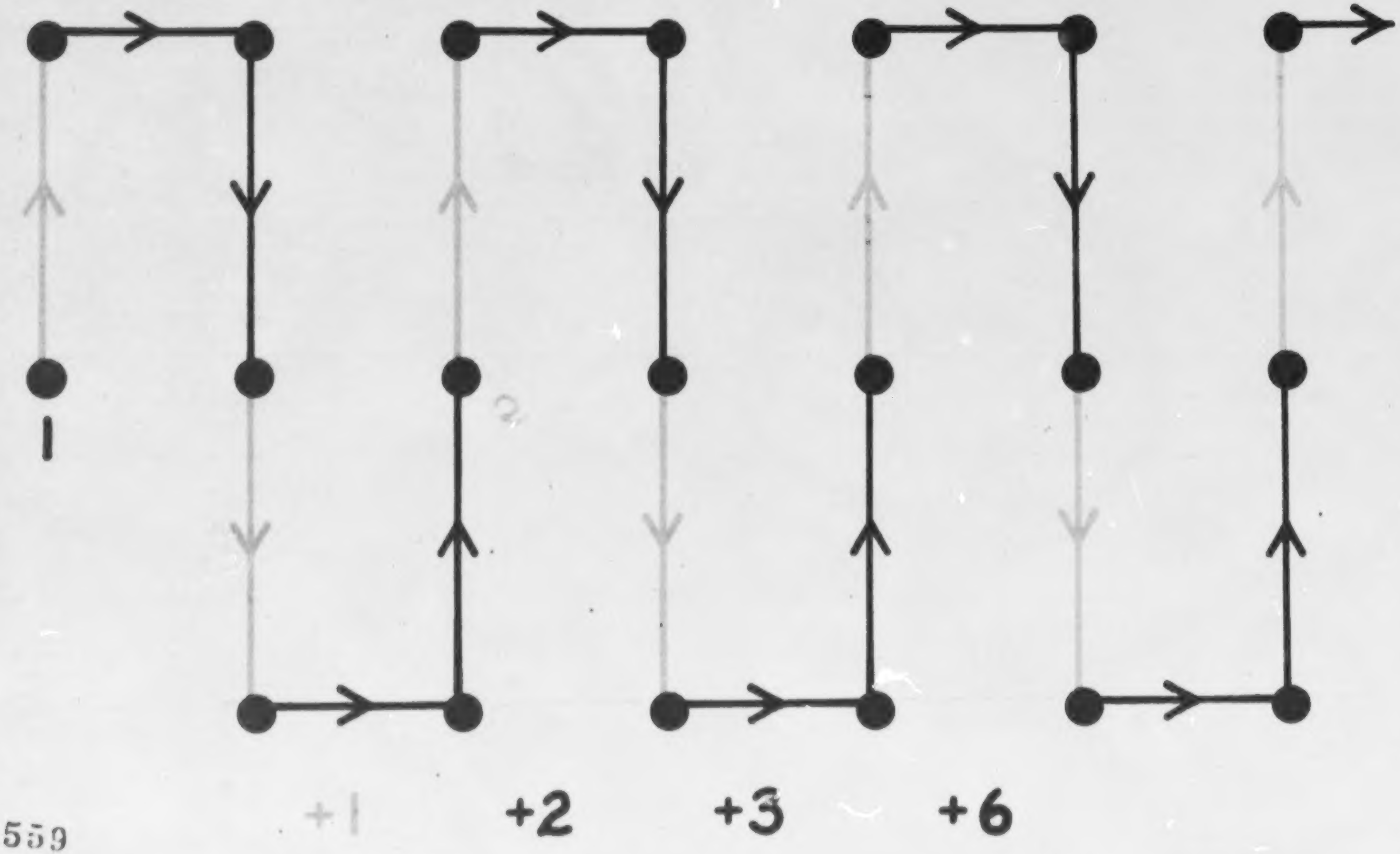
+2

+5

S 62.2 *

Name ______________________

Label the dots. Draw all the +6 arrows.



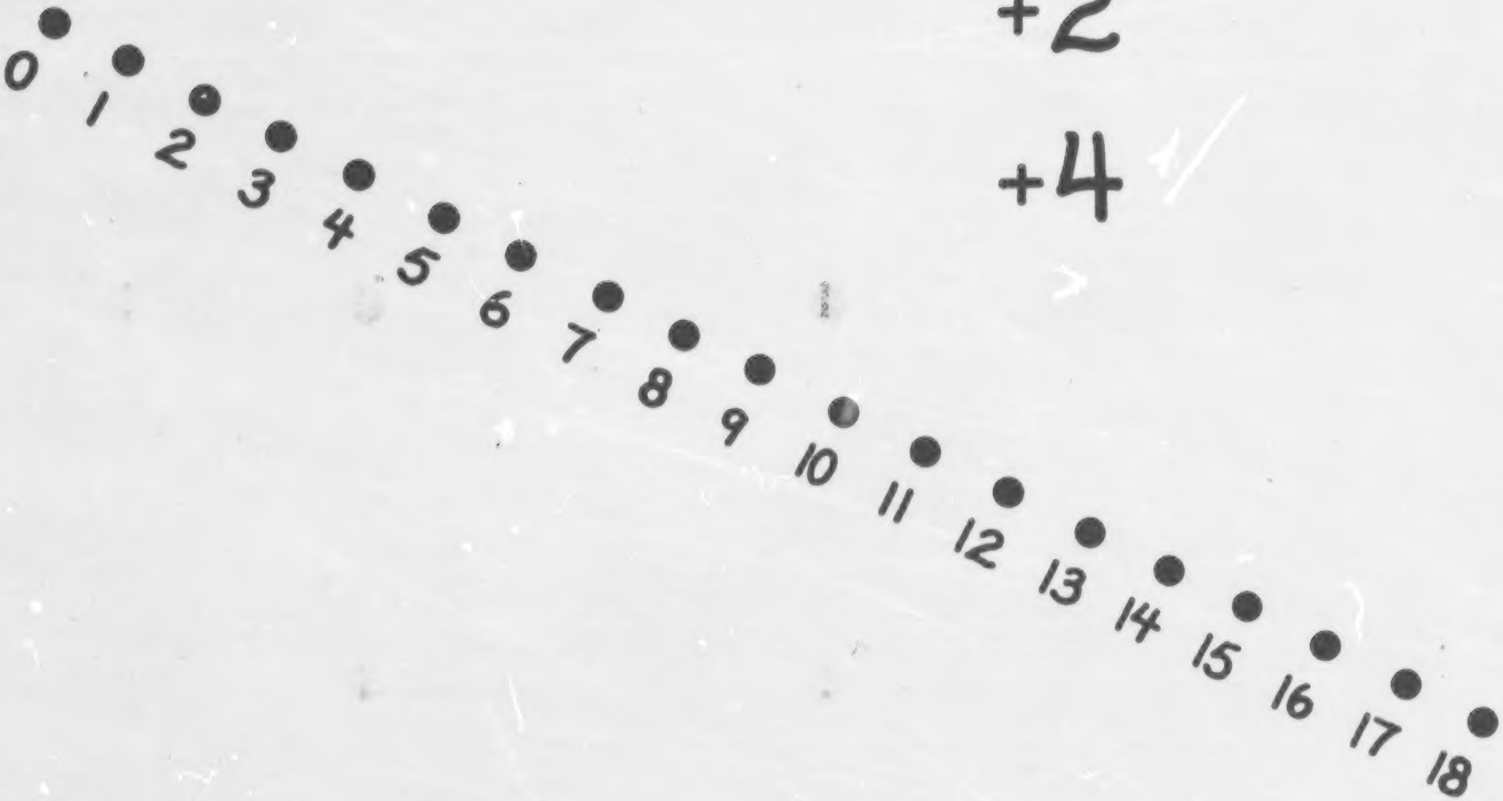
S 62.2 **

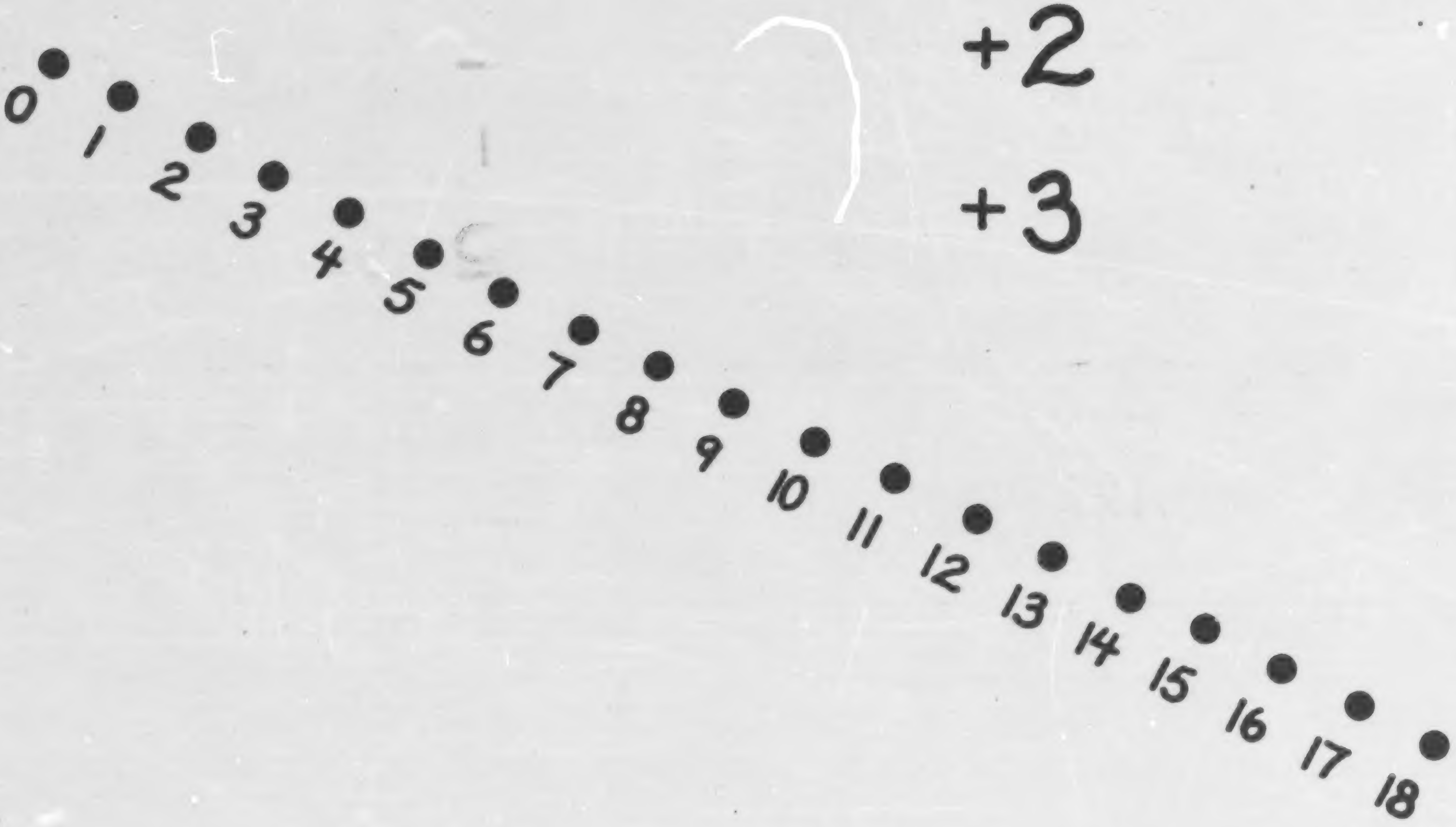
Name ________________________

S 66.2

+2

+4




+2
+3

Name ____________________

S 68.2 *

Complete.

$1 + 1 = \square$

$2 + 1 = \square$

$3 + 1 = \square$

$4 + 1 = \square$

$5 + 1 = \square$

$1 + 1 = \square$

$2 + 2 = \square$

$3 + 3 = \square$

$4 + 4 = \square$

$5 + 5 = \square$

$10 + 1 = \square$

$10 + 2 = \square$

$10 + 3 = \square$

$10 + 4 = \square$

$10 + 5 = \square$

$10 - 1 = \square$

$10 - 2 = \square$

$10 - 3 = \square$

$10 - 4 = \square$

$10 - 5 = \square$

6 + 6 = ☐
7 + 7 = ☐
8 + 8 = ☐
9 + 9 = ☐
10 + ☐ = 20

6 + 5 = ☐
7 + 5 = ☐
8 + 5 = ☐
9 + 5 = ☐
10 + ☐ = 15

6 + 1 = ☐
6 + ☐ = 8
6 + ☐ = 9
6 + ☐ = 10
6 + 5 = ☐

8 + ☐ = 10
8 + ☐ = 12
8 + ☐ = 14
8 + 8 = ☐
8 + 10 = ☐

Name ______________________________

S 68.2 **

Complete.

14 − 4 = □
13 − 3 = □
12 − □ = 10
11 − □ = 10
□ − 0 = 10

10 + 5 = □
20 + 5 = □
30 + □ = 35
40 + □ = 45
□ + 5 = 55

7 − 3 = □
7 − 4 = □
7 − 5 = □
7 − □ = 1
7 − □ = 0

□ = 10 + 10
□ = 20 + 20
60 = 30 + □
80 = □ + 40
100 = 50 + □

$100 + \square = 200$

$101 + 101 = \square$

$102 + 102 = \square$

$103 + \square = 206$

$\square + 104 = 208$

$\square = 50 + 50$

$\square = 51 + 51$

$104 = \square + 52$

$106 = \square + 53$

$108 = 54 + \square$

$\square = 100 + 0$

$100 = 98 + \square$

$100 = 96 + \square$

$100 = 94 + \square$

$100 = \square + 8$

$5 + \square = 10$

$15 + 15 = \square$

$25 + \square = 50$

$35 + 35 = \square$

$45 + 45 = \square$

Name ____________________

S 69.2 *

Complete the number stories.

20 + 5 = ______

---

11 + 8 = ______

---

12 + 4 = ______

---

20 + 14 = ______

---

44 + 10 = ______

12 + 24 = _____

41 + 18 = _____

22+ 15 = _____

80 + 17 = _____

51 + 26 = _____

34 + 43 = _____

Name ______________________

S 69.2 **

Complete the number stories.

24 + 15 = _____

---

25 + 41 = _____

---

42 + 33 = _____

---

56 + 40 = _____

---

24 + 33 = _____

24 + 35 = ______

---

28 + 22 = ______

---

25 + 46 = ______

---

21 + 49 = ______

---

46 + 18 = ______

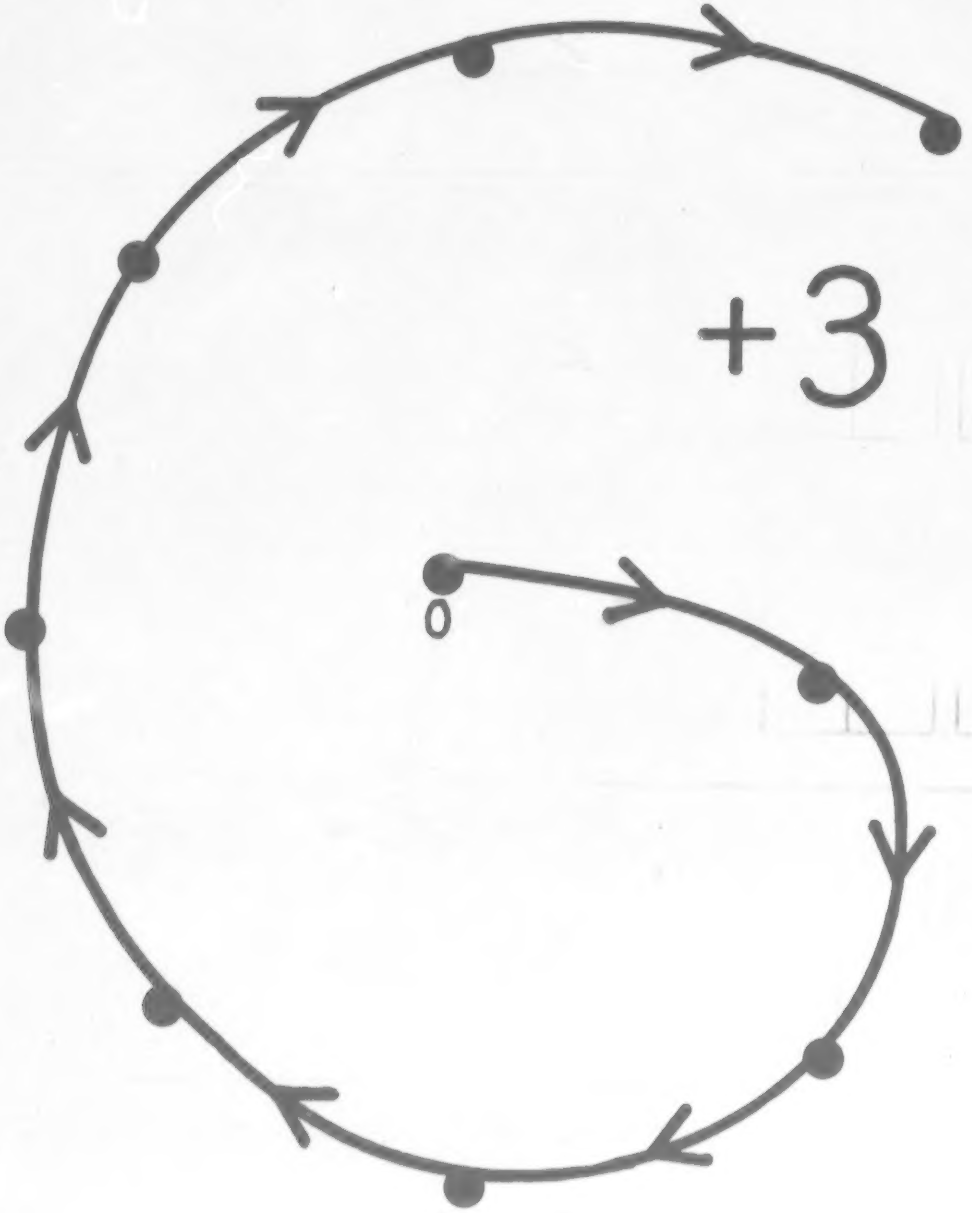
---

68 + 26 = ______

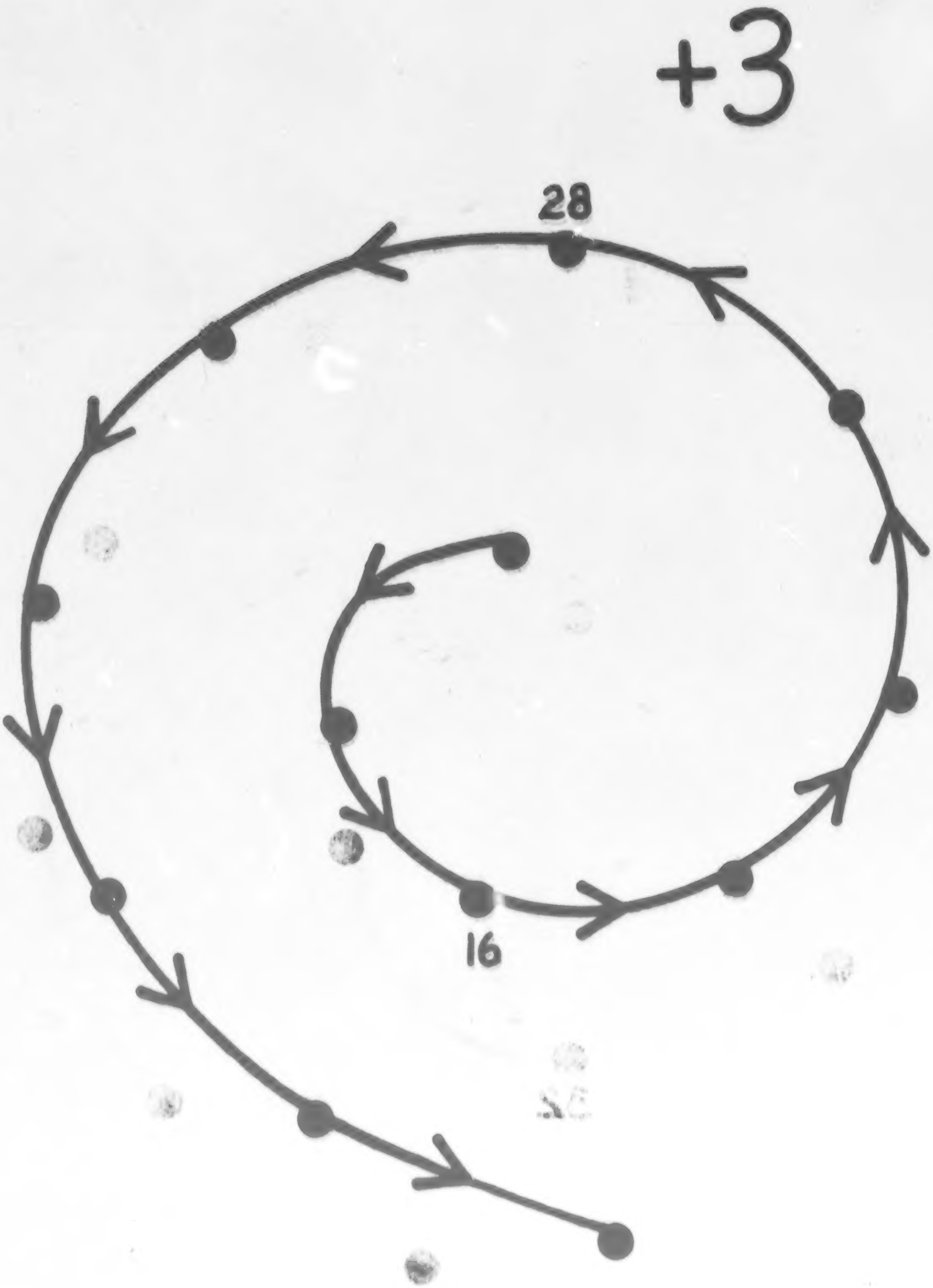
Name ______________________________

S 71.2 *

Label the dots.



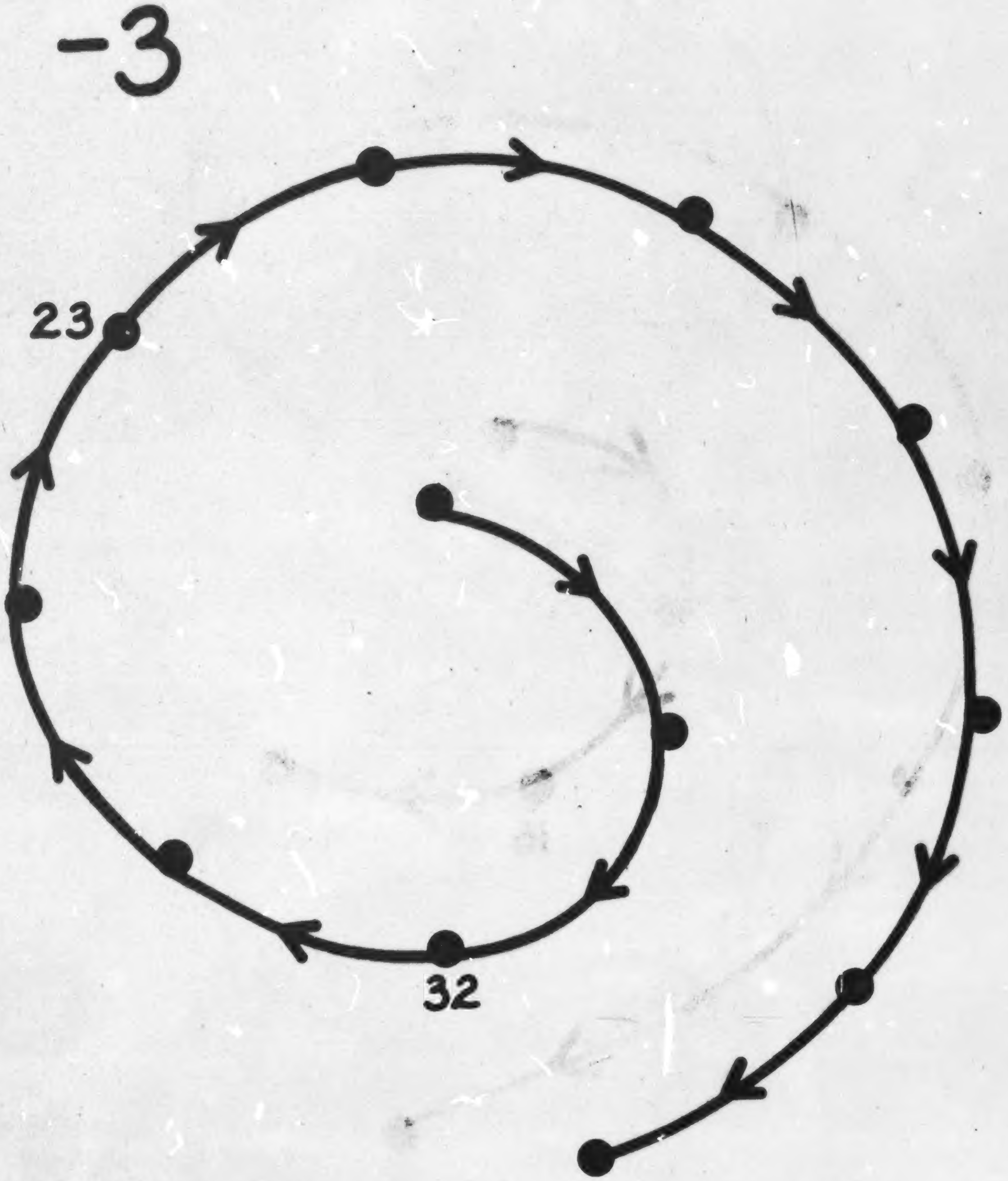
Label the dots.



Name ________________________

S 71.2 **

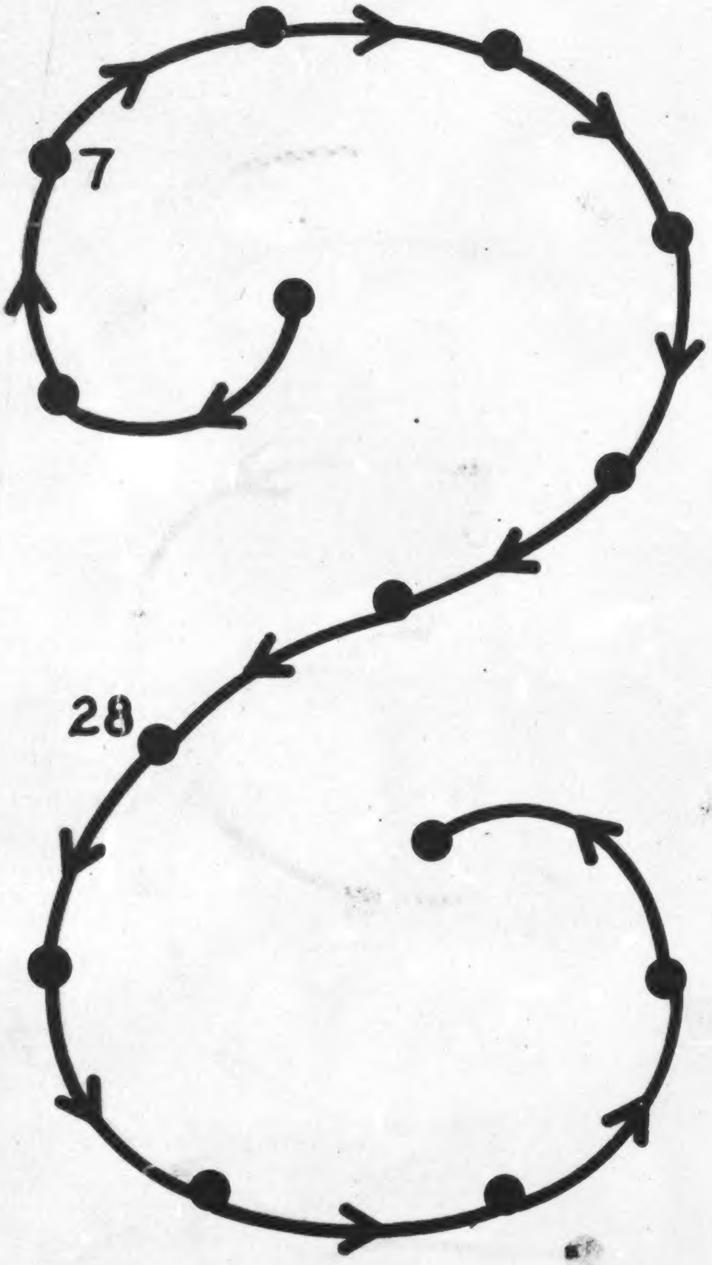
Label the dots.



Label the dots.

+10

−3

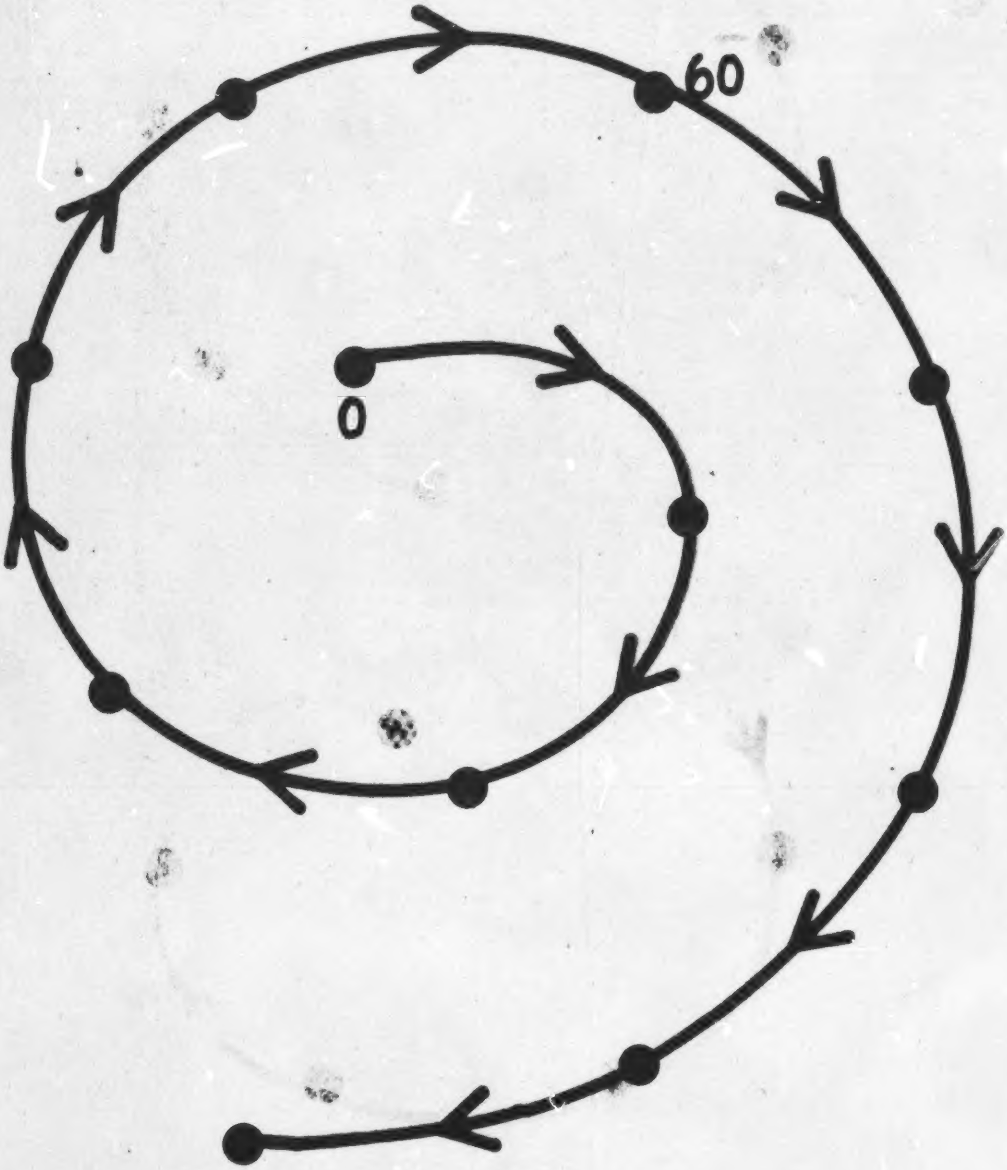


Name ______________________________

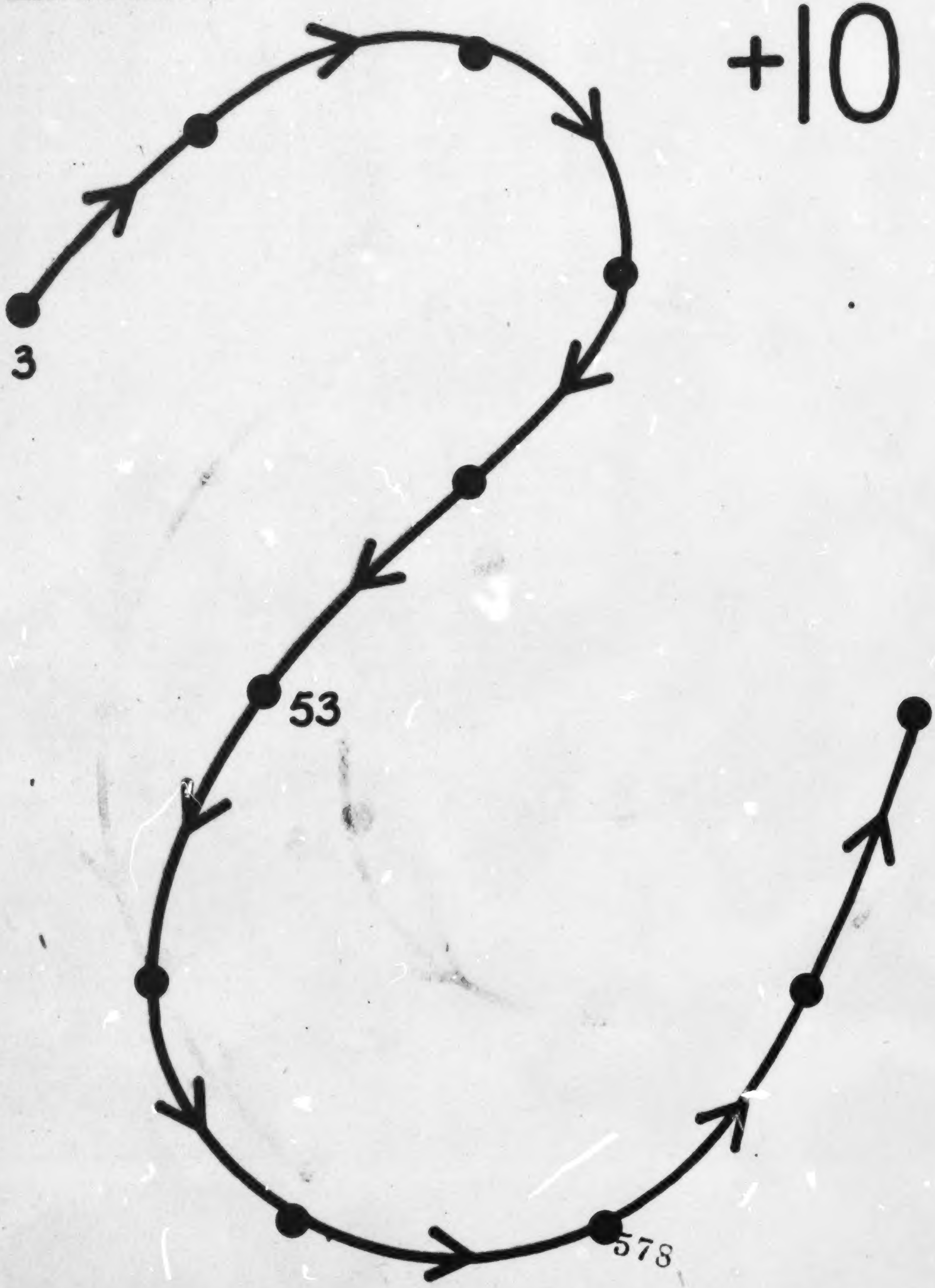
S 75 *

Label the dots.

+10



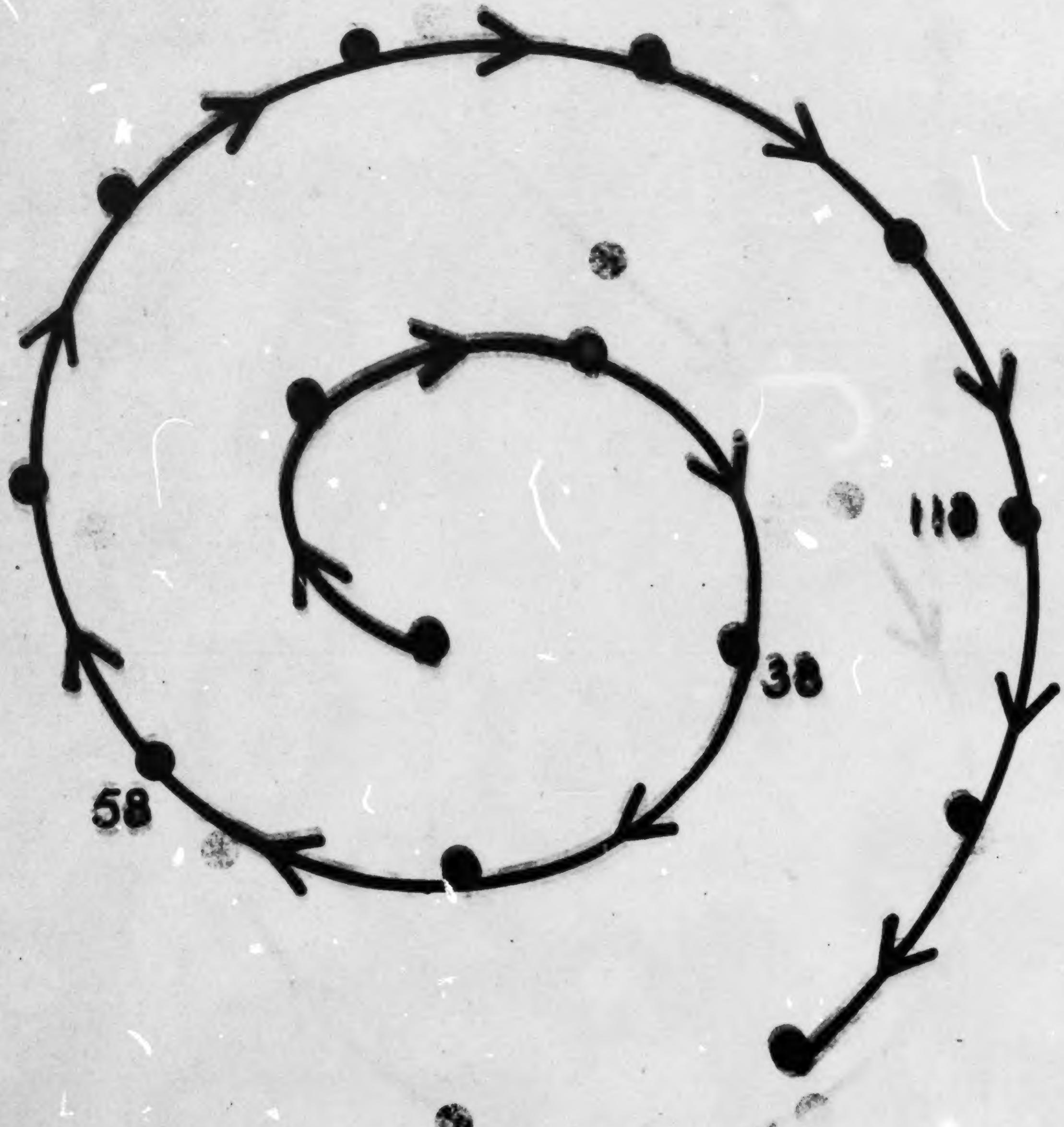
Label the dots.



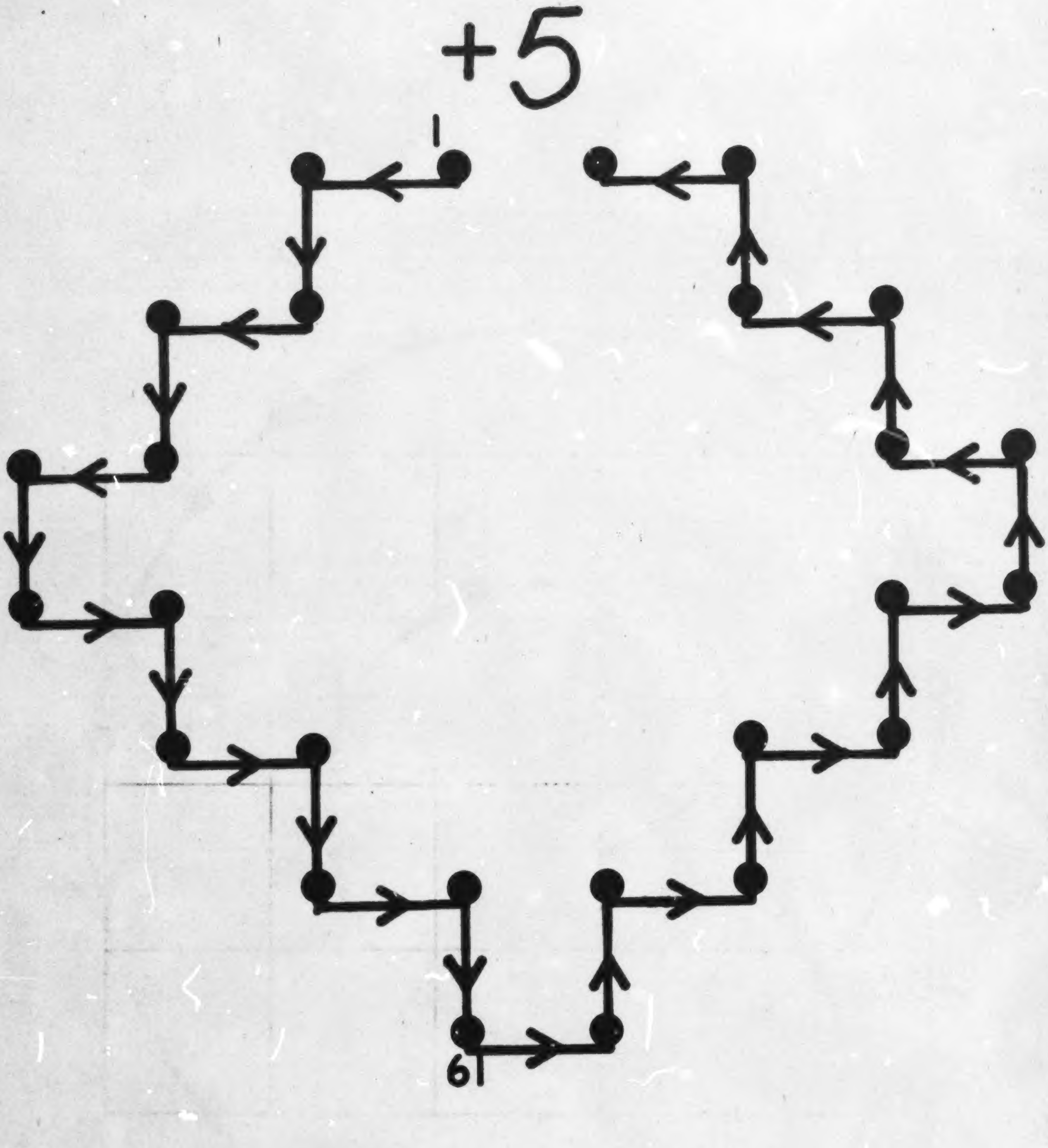
Name ______________________ S 75 **

Label the dots.

+10



Label the dots.



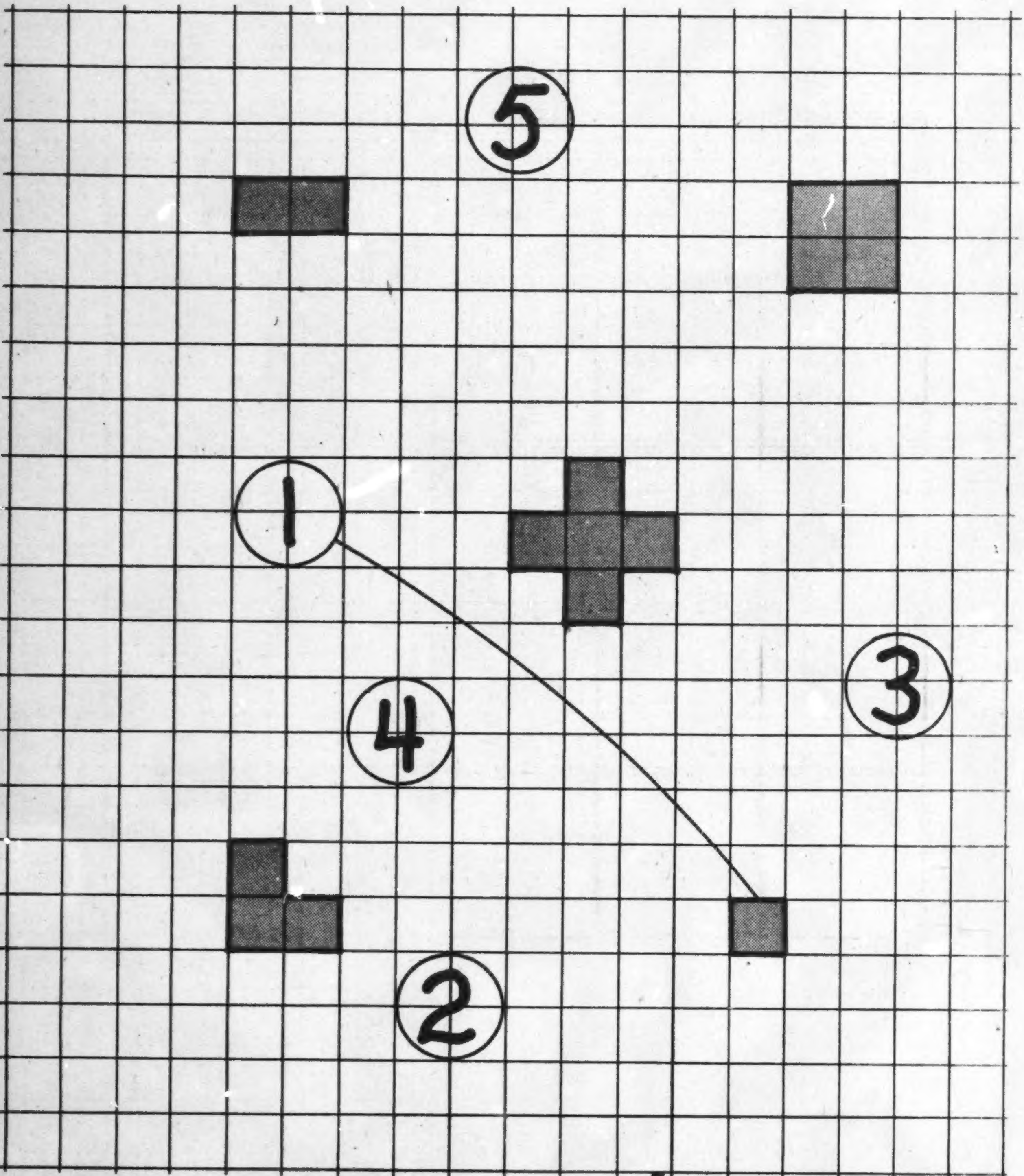
Name ________________________

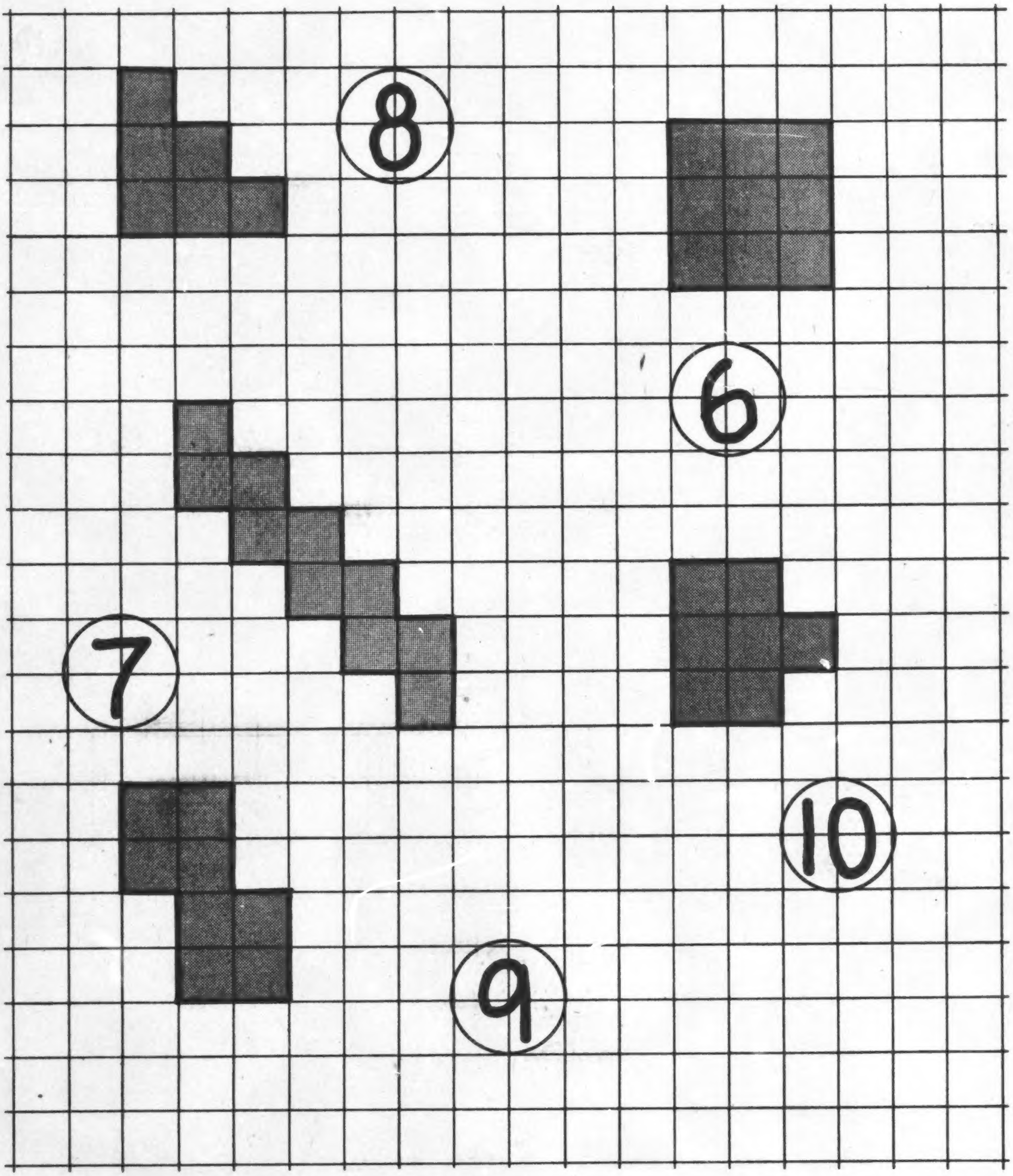
S 76.2 *

Name ___________________________

S 76.2 **

Pair the numbers with the shapes.

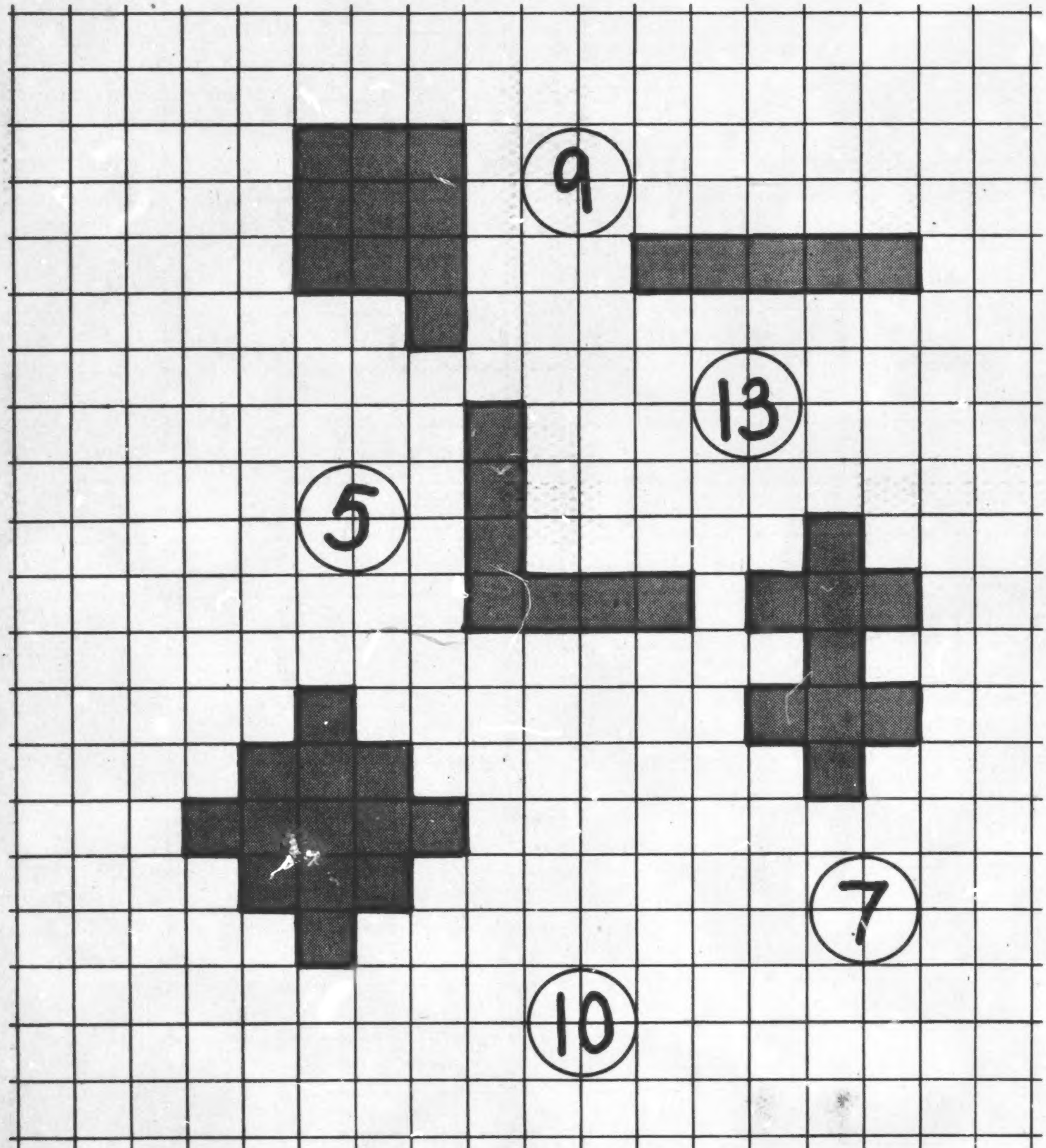


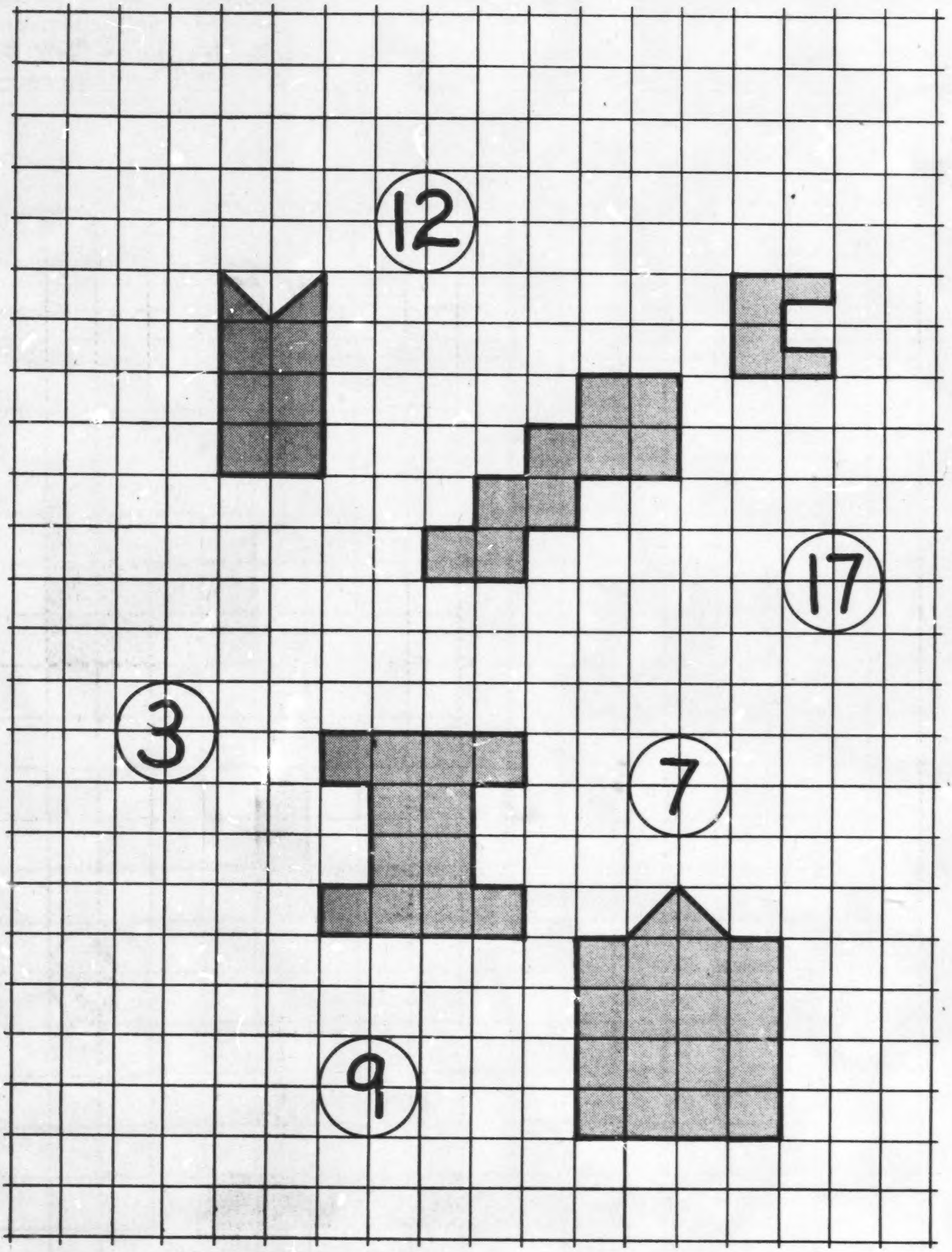


Name ______________________________

S 76.2 ***

Pair the numbers with the shapes.

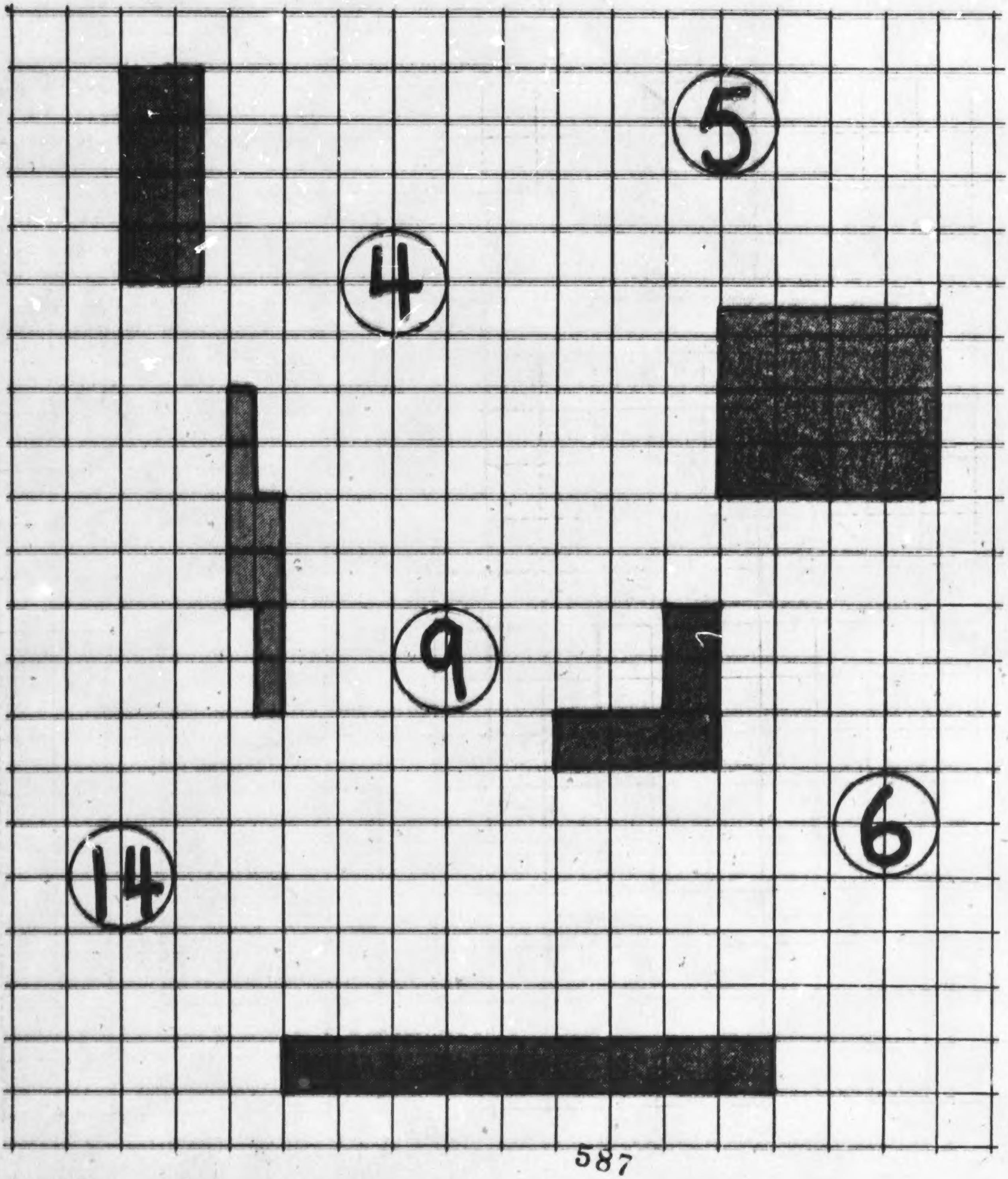


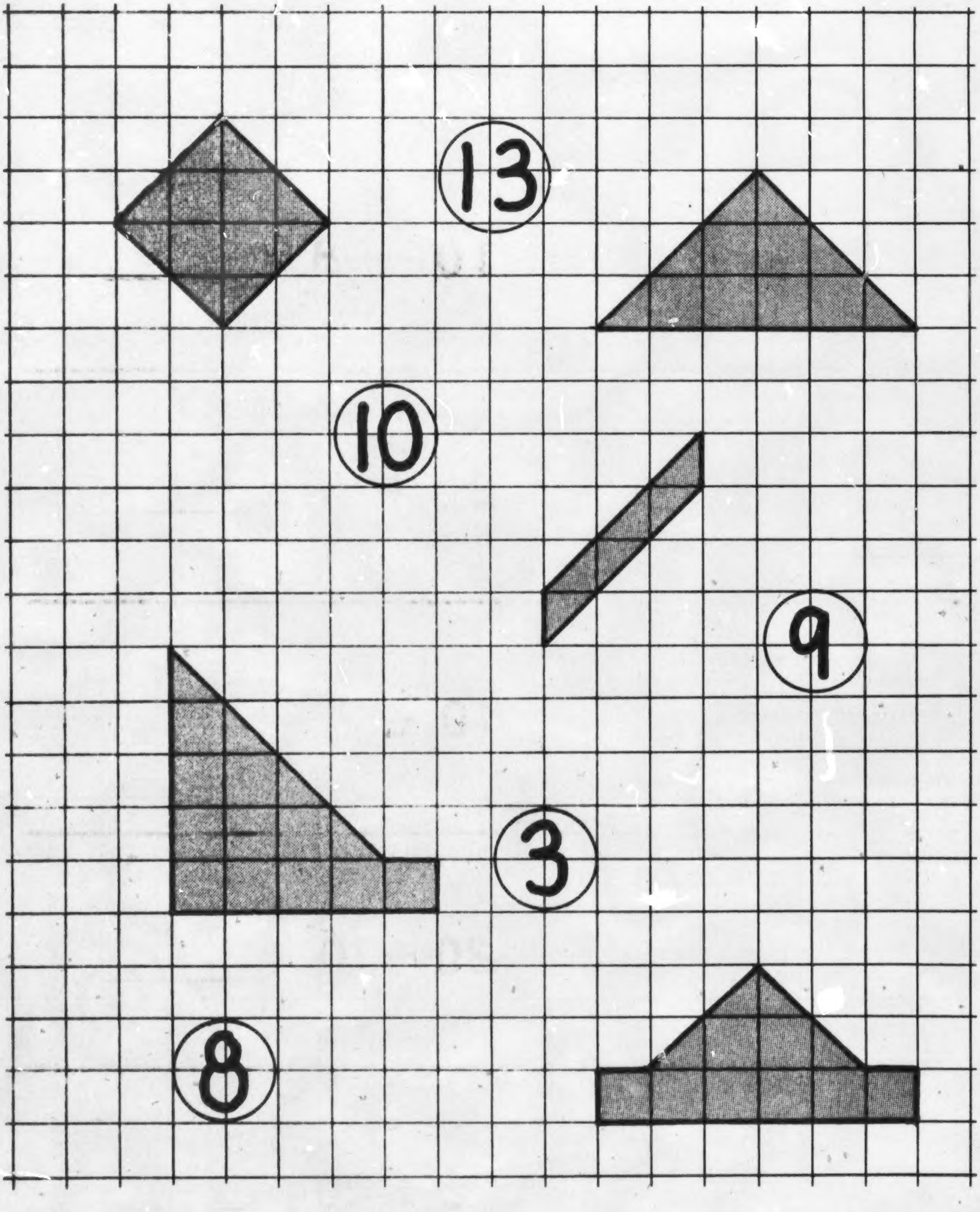


Name ______________________________

S 76.2 ****

Pair the numbers with the shapes.

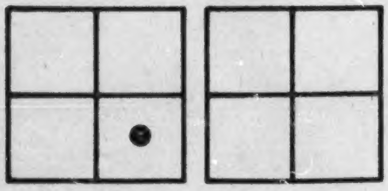




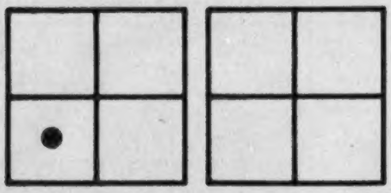
Name ______________________________

S 78.2 *

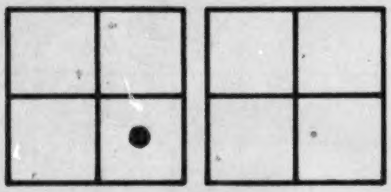
Complete the number stories.



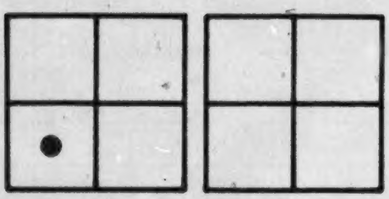
10 + 8 = _____



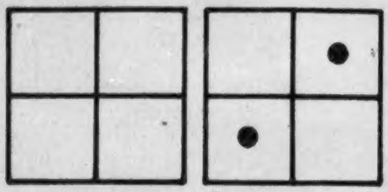
20 + 4 = _____



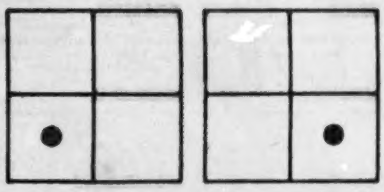
10 + 5 = _____



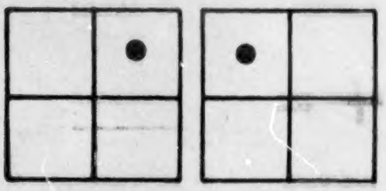
20 + 10 = _____



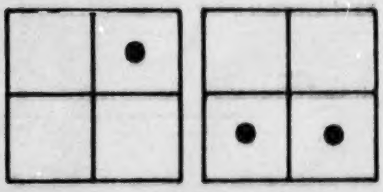
6 + 20 = _____



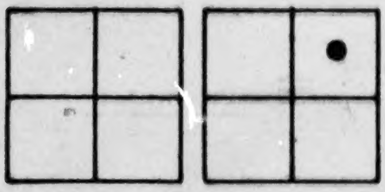
21 + 8 = ____



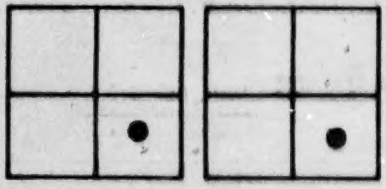
48 + 10 = ____



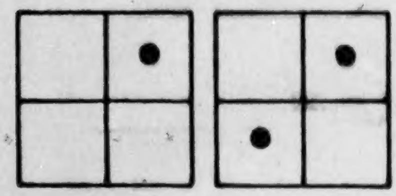
43 + 4 = ____



4 + 12 = ____



11 + 42 = ____

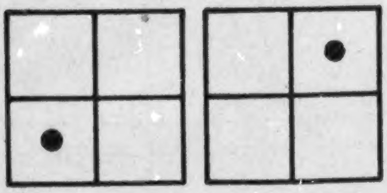


46 + 21 = ____

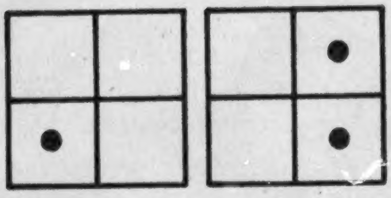
Name ______________________________

S 78.2 **

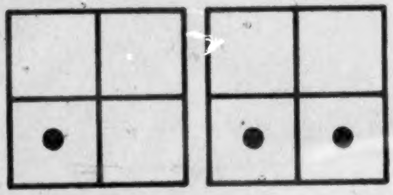
Complete the number stories.



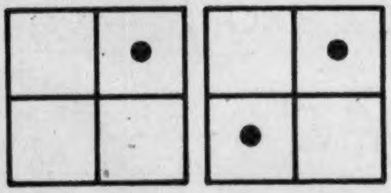
$24 + 14 = \underline{\qquad}$



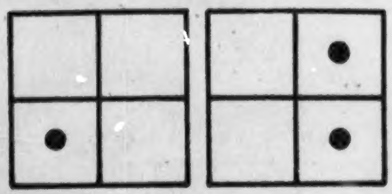
$25 + 11 = \underline{\qquad}$



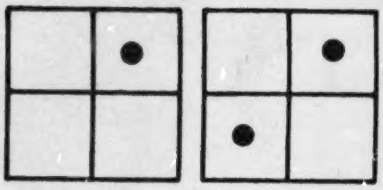
$23 + 42 = \underline{\qquad}$



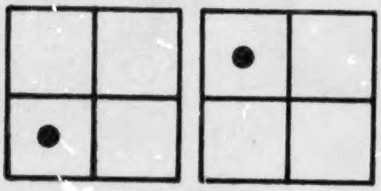
$46 + 41 = \underline{\qquad}$



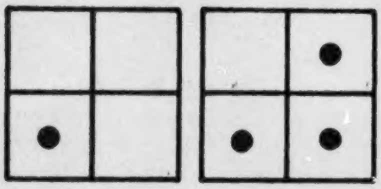
$25 + 30 = \underline{\qquad}$



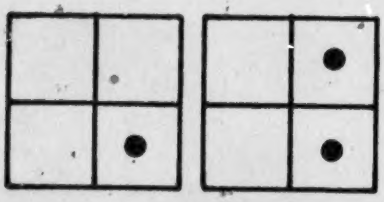
46 + 24 = ______



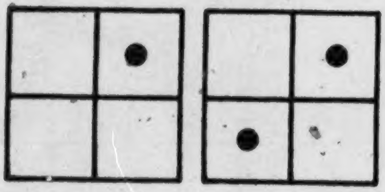
28 + 23 = ______



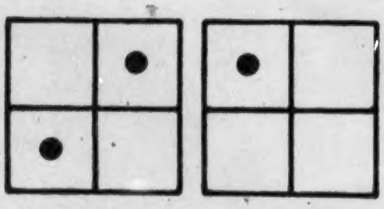
27 + 46 = ______



15 + 49 = ______



46 + 18 = ______



68 + 24 = ______